Traffic Quarterly

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Published quarterly by the Eno Foundation at Saugatuck, Conn., issue for October, 1948.
Printed in U. S. A.

An Editorial

ARRAYS of statistics and the means of comparing highway casualties are often perplexing, conflicting, and fallacious. They lead us into errors in judgment of the effectiveness of efforts to improve one phase of the traffic problem. Casualty results as compared in periodic summaries are largely accidental and not the result of organized intensive corrective efforts.

The mechanics of operating an average car, if once properly learned, are almost as simple as sewing on a button. This is not to imply that every operator is adept or that each one remotely appreciates the capabilities of his machine or faintly realizes the dangers of his improper use of it. Under the present system of granting operator permits, these common-sense requisites are matters of conjecture and are left for determination to trial and error methods.

In the final act of paying a fee and receiving an operator's permit, the driver feels he has passed a new way-point in life and has graduated into a superior class of citizens—the motoring intellectuals.

He has. He was given his coveted degree by meeting minimum requirements of a basic examination. This examination is simple and inadequate, often carelessly given, and as varied as the issuing authorities in the forty-eight states.

The new graduate driver is sent on his way, both he and the examiner having little knowledge of his aptitude, judgment, or attitude. His driver-attitude is usually an indication of his fear, courage or ignorance with only on rare occasions some mark of courtesy.

Improvement in our outmoded and unwarranted process of qualifying drivers is long overdue. Improvements in our present system in turn will improve our drivers. Good drivers are in the majority. They should not suffer for the ignorance and willfulness of the few. Are we not, with our present system, qualifying drivers and yet in due course arresting them, because they prove in practice they are not qualified? Accidents will continue to happen but there is general agreement that we are not meeting the problem.

Education at best is a slow process, almost impossible without the will to learn.

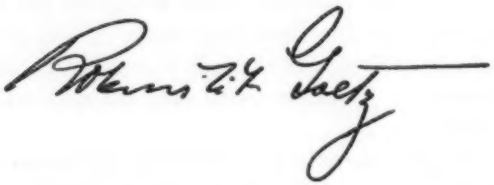
The best psychology of mass driver-education would appear to be an incentive to learn or in this case some incentive to become a better driver through proven ability and a certificate of evidence to honor it.

Certainly all candidates for the driver's permit are not uniformly prepared, do not pass the test with the same degree of satisfaction to themselves or the examiner and most certainly they do not drive uniformly well.

Recent exploration into the field of driver attitudes may well make it possible to include this phase of driver qualification in the driver's test.

Present methods and results warrant consideration of a system for *classifying* drivers with respect to skills when their permits are issued. Such a system could grant A, B, or C licenses on the basis of demonstrated ability, and could provide for raising or lowering a driver's classification on the basis of his subsequent performance.

It is a characteristic American trait that each American strives to excel. The constant improvement of driver skills can be accomplished only if demonstrated driver-responsibility receives national recognition as a prerequisite to licensed driver-competence.



Some Operational Aspects Of State-Wide Highway Planning

D. GRANT MICKLE

Mr. Mickle has been director of the Traffic Engineering Division of the Automotive Safety Foundation, Washington, D. C. since 1943. From 1940 to 1943, he was traffic engineer for the City of Detroit and consulting traffic and safety engineer of the Michigan State Highway Department. Mr. Mickle had previously been with the Traffic Division of the Massachusetts Department of Public Works, director of the Public Works section of the Massachusetts Highway Accident Survey, field supervisor of the Arkansas Traffic Survey for the United States Bureau of Public Works, assistant director of the Michigan Highway Planning Survey, and manager of the Traffic and Transport Department of a private firm of engineers in Michigan. He holds membership in the American Society of Civil Engineers, in the Institute of Traffic Engineers, in the American Association of Public Works Officials and in the American Society of Planning Officials. He is a past president of the I. T. E.

CATCHING up with ever-increasing demands for road improvement has, for many highway departments, become something of a forlorn hope. Today, the only chance of catching up within reasonable time lies in discarding the piecemeal methods of the past for a truly organic development of the state-wide network of roads and streets.

Accumulated highway deficiencies have become too formidable, and motor-vehicle traffic too huge and complex, for anything but a comprehensive, long-range attack on the problem. We are entering an era of highway transportation when automobile travel will exceed anything we have ever known. Last year vehicle registrations rose to thirty-seven millions—three millions more than the previous all-time high. Motor mileage soared some thirty-five billion miles above the record-shattering total rolled up in 1941. By 1960, the travel volume is expected to be at least 50 percent greater than the prewar peak.

Of hardly a state in the Union can it be said that the physical road-plant is adequate for today's heavy traffic movements with safety and dispatch. Everywhere the enforced lag in construction during the depression and war period has put highway programs back ten or fifteen years. Meanwhile, maintenance has been rigidly curtailed in most instances, resulting in accelerated deterioration. Extensive sections of roads and streets are obsolete or worn out. Roads wear out as inevitably as human beings; and the Public Roads Administration recently estimated that 42 percent of the high-type roads on the Federal Aid System, and 68 percent of the intermediate type, will wear out within the next ten years.

Competent Planning for Loads to Come

It is vital to start planning now, not only to remedy current shortcomings but to cope with the situation a decade or a score of years ahead. Then the burden on the highway plant will be tremendously increased. Trying to hold the line against mounting inadequacies would merely prolong the losing battle that state highway departments have waged in the past.

To plan properly a broad-gauge program of road rehabilitation, it is imperative first to make a complete factual appraisal of the state's highway needs, the costs involved and the benefits to be anticipated. All pertinent facts must be scientifically collected and analyzed. Such facts, to list a few major categories include road-inventory data, traffic-volume figures, the facts of road use, of origin-and-destination of highway movements, the facts of vehicular sizes and weights, and of design features as they relate to traffic operations.

A comprehensive plan must set forth not only the roads to be improved and the standards, but also in what order. The proposed modernization must be measured not only in terms of expanded capacity; it must be evaluated in terms of maintaining essential services; of promoting industry, commerce, agriculture, tourist trade; of integrating highway transport with railways, airways and waterways; of fostering employment and social convenience; of stabilizing property values and preventing urban blight, of alleviating traffic congestion, reducing vehicle operating costs and saving lives.

New frontiers in the technical use of factual data have been opened with the development of the statewide planning study. In this type of study, California and Michigan have conspicuously pioneered, but it is being further refined in other states. Studies are under way in Washington, Oregon, Kansas, Illinois and Nebraska. At least a dozen other states are contemplating similar fact-finding investigations.

Primary Objects of Statewide Planning

The new process of statewide study and reporting has received the endorsement of numerous organizations and agencies like the American Association of State Highway Officials, the Highway Research Board and the Public Roads Administration.

The primary objective of the statewide planning technique is to provide the basic data for charting a balanced and orderly road program, in keeping with sound economy and the public interest. It serves to establish a practical formula for the equitable distribution of limited highway funds among the several classes of roads and streets within the state. Moreover, it helps eliminate both guesswork and political pressure in determining the priority of projects, and to discourage such wasteful practices as the diversion and dispersion of road-user taxes.

Long-range planning studies have brought into unusual prominence the operations phase of highway engineering. This in the past has been largely overshadowed by construction and maintenance functions of highway departments. Increased emphasis on operational, or traffic engineering, aspects of the road problem is easy to understand. Both long-term planning and traffic engineering are principally concerned with functional values. Planning blueprints a functional highway transportation system that will best promote the economic and social advancement of the state as a whole. Traffic engineering seeks efficiency and safety in new roadways and a simultaneous functioning of the existing system at maximum capacity and convenience.

Even more fundamental, the two activities are based on an objective determination of all the relevant facts. Intensive inquiry into traffic operations is an indispensable part of the exhaustive

fact-finding that provides the foundation for the state's master plan. A traffic engineering committee is regularly set up as one of the technical bodies involved in the engineering phases of the work. One of the most thorough-going documents on the relation of operational features to long-range planning is the report recently prepared by the Traffic Engineering Committee for the Washington State highway study.

The Broad Base of Long-Range Planning

Traffic planning is, of course, only one component—though an eminently vital one—of general highway planning. In its broad sense, highway planning impinges not only on the work of traffic supervision and control but on every activity and bureau of the highway department, including finance, construction, maintenance, research. Indeed over-all planning goes far beyond departmental fact-finding, drawing on information assembled by highway units of the state's political subdivisions, and particularly on the physical and economic data developed cooperatively by states and various national agencies.

For instance, the state planning surveys conducted continuously in the last twelve years as a joint enterprise of state highway departments and the Public Roads Administration, have developed strategic tools for appraising road needs in the light of traffic requirements. These surveys are an abundant source of factual material and procedures for the new statewide studies. But—long-range planning requires a considerably broader base of investigation. Fact-finding techniques must be expanded to cover county, city and township roads and streets, as well as state highways to which the planning surveys are limited.

The emergent role of traffic engineering in the planned and coordinated approach to the highway problem reflects a progressive shift from the exclusively structural, or static, concept of road design to a dynamic concept embracing all factors that bear on effectual movement. In the early days of the automobile, the chief preoccupation of administrators and engineers was to expand the road system as rapidly as feasible and to maintain it as well as possible.

Structural strength was the predominant consideration. Research was limited more or less to methods of construction and to improvement and control of materials. Such advances as were effected in design practices were rarely based on traffic performance and need, as interpreted from facts obtained in the field.

With the growth of motor travel in the last two decades, geometric design-features like grade, curvature, number and width of lanes, superelevation, sight-distances, intersections, entrance and exit points, are fully as important as the structural elements. The vital relationship between sound design and the amount, character and behavior of complicated movements the road must support, has been brought more distinctly into focus.

It is recognized, moreover, that only by complete understanding of the performance-ability of drivers, an understanding of drivers' desires, the characteristics of their vehicles, and of specific limitations of both driver and vehicle, can facilities be designed, constructed and operated to best advantage.

Collection of traffic data and their application in matters of alignment and dimensional design are duties generally segregated within the field of traffic engineering. Checking the adequacy of plans for new roadways is acknowledged to be as much a part of the traffic engineer's job as his other function of guiding, controlling and expediting movement on streets and highways.

Many state highway departments have centralized these responsibilities in a specialized traffic engineering division. The division is separate from and of equal status with construction, maintenance, business management and the other primary units. In the counties and cities, though the organizational pattern may vary, the scope of traffic engineering functions is essentially the same.

Measuring Total Road Needs

At any rate, we look today to the traffic engineering specialists for a substantial portion of the research and investigation that provide indices for measuring total road-needs. The different techniques that develop quantitative and qualitative information on highway movement, and tell us where the traffic now goes, where it wants to

go, and where it will go in the future, constitute the core of long-range planning.

The origin-and-destination study, in particular, is invaluable for determining current traffic-patterns and future trends. This personal-interview type of survey reveals the termini of individual trips, the reasons they are made, and their frequency. Resultant data is being used successfully in attacking problems of congestion and parking, as well as for locating and designing urban expressways, and for improving other arterials and distribution routes.

Volume-studies turn a spotlight on the size and composition of the traffic stream, on types of vehicles and vehicle-loading, on the number of pedestrians, and on the periods of minimum and maximum flow. These investigations help to establish the relative efficiency of specific roads, and to delineate aspects that require corrective treatment. They show what roadways have reached the saturation point. Where major reconstruction is indicated, they aid in selecting proper design standards. Naturally, too, the facts of traffic volume have a good deal of weight in determining the sequence of projects in the over-all program.

Within the compass of traffic facts, also, is information developed in traffic engineering studies of accidents, parking, and time-and-delay. Accidents are no longer regarded as the inevitable toll of motor use but as definite symptoms of inefficient transportation. By establishing the locations, times, circumstances, conditions and actions that contribute to mishaps, the accident-studies point the way for attacking root causes on thoroughfares old and new.

Parking studies measure the demand for storage space both on and off the street. They measure the availability of parking areas in relation to the principal termini of vehicle trips. The influence of parking shortage on congestion, urban decentralization and accidents is carefully scrutinized. This factual background makes it possible to spell out methods to overcome immediate needs and to define requirements that will be created as a result of any extensive construction contemplated in the master road plan.

Time-and-delay studies probe into factors that contribute to interrupted and disorderly traffic—traffic that costs the motorist both inconvenience and delay. Allied operational investigations deal with

speed zoning, establishment of no-passing zones, and the design and location of traffic-control devices.

As has already been indicated, there are other important areas of research—road-use studies, road-life studies, fiscal studies—findings that must be correlated with traffic data to provide the factual framework of long-range planning. Over the years, planning-survey units in state highway departments have been generating these facts on roads and highway economics.

Increasing the Efficiency of Existing Roads

It is necessary, as a preliminary step, to examine to what extent the existing roadways are being used to their full service potential. Otherwise how can *new* facilities be justified? In many cases, expressways and other major improvements will offer the only realistic solution. Yet we shall have to depend upon most of our present roads and streets for a long time. This leaves no alternative but to discover ways and means to use them more efficiently and safely.

Fortunately there are any number of relatively inexpensive things that can be done. Many weaknesses can be quickly remedied through recognized procedures of traffic engineering. Often these simple corrective measures produce not only immediate but lasting benefits.

Excellent results, for example, have been obtained by the use of channeling islands at important intersections to control the path of vehicles, and by using pedestrian islands and divisional strips on wide thoroughfares. These islands have proved particularly effective in avoiding or reducing disorders that arise from conflicting movements at complex and irregular crossing points. Whether employed to separate opposing traffic flows, to provide refuge for people on foot, or to provide safe zones for transit-loading, the structures are constantly winning greater approval.

Re-routing has greatly eased congestion in many cities. The advantage of re-routing is that it re-directs the main flow of traffic in line with current conditions instead of in a pattern that may have existed since pre-automobile days. Traffic capacity and speeds may frequently be increased by establishing a series of through-streets

for preferential movement. By-pass routes can also be set up to siphon off a considerable bulk of the traffic that now clogs the central business districts.

"All-rolling" regulations, as a means of alleviating the downtown traffic jam, have been successfully instituted in major cities like Providence, Boston, Philadelphia, Chicago, Detroit, St. Louis, and Dallas. Such a rule forbids stopping, standing, or curb-parking on main arteries within and leading to the central trading area.

Chicago offers a good example of the methodical use of traffic-engineering measures to solve a difficult traffic problem. Back in the 'twenties, congestion reached intolerable proportions on State Street in the Loop District. A technical analysis of conditions led to a three-fold plan. Curb parking was banned. Left turns were prohibited. Traffic signals were coordinated to keep traffic moving. The combination of these expedients brought immediate relief, but more than this, the street has enjoyed comparative freedom of movement ever since, despite greater traffic volumes.

Useful Restriction of Turning Movements

Restriction of turning movements is another useful tool, applied in a variety of ways to prevent traffic entanglements, especially where pedestrian and motor movement conflict. In some instances, a total ban on turning maneuvers may be called for; in others, turns may be limited to certain times of day, certain stretches of main arteries, or to individual intersections.

Detroit's Grand River Boulevard, one of the nation's busiest streets, carrying upward of 60,000 vehicles daily, illustrates the effectiveness of turning controls. Formerly left-turns were so frequent that the two inner lanes of the six-lane pavement were almost useless as carriers of arterial traffic to and from the city. Congestion was chronic and accident-frequency high. Prohibition of left-turns at all times along its fourteen-mile length has greatly fostered fluidity of movement, adding in effect another traffic lane in each direction. Running time has been cut by nearly twelve minutes, and accidents have been materially reduced.

Another practical method of relieving congestion is the designa-

tion of one-way streets. One-way movement reduces complications at intersections as well as the center friction caused by vehicles traveling in opposite directions. Experience has shown that by converting a pair of two-way streets into one-way thoroughfares, capacity can often be increased up to 50 percent, accident-frequency halved, and travel-time reduced a third or more.

Reversal of the traffic flow has demonstrable value in adjusting the capacity of principal streets to the directional pattern of movement at peak-hours, such as the influx of vehicles into urban areas in the morning and the outbound travel in the evening.

Segregation of vehicles according to functional use may also be helpful in bringing about more flexible and expeditious movement. Basis for separation, it is generally agreed, should be characteristics of travel rather than of vehicular types. In other words, instead of limiting some routes to private cars and others to commercial vehicles and transit, the yardstick should be the rate of their normal speed and the frequency of their stops.

Good Signs and Bad Ones

Traffic signals, signs and markings can be a potent force in the betterment of traffic conditions. But unless these devices meet uniform-design standards and are judiciously located, they intensify traffic confusion. Illegible or ill-placed signs, faulty pavement markings or the absence of markings, cause indecision on the part of drivers. This in turn disrupts the flow of traffic.

Misapplication or excessive use of traffic signals will defeat their primary purpose, which is to assign right-of-way to alternate flows of traffic. Installation must be governed by sound engineering principles, not by the whim of private interest, no matter how well-intentioned. Generally speaking, uniform signals, synchronized for progressive operation, can create order out of chaos at busy intersections, commonly the focal points of urban congestion.

Public transit must figure importantly in any plan to increase traffic efficiency. Better loading and terminal facilities, as well as improved routing and scheduling would in many cases help to lessen congestion. Where necessary, special services should be provided,

such as expressways to outlying districts, off-peak shoppers' service, and shuttle service to fringe parking lots.

Virtually every city of any size is suffering from an acute parking shortage; and until this is remedied, all other corrective measures will fail to some degree. Even the finest facilities for moving vehicles in and out of urban centers will not suffice. There must be adequate space for cars at rest, and that space is not to be found at the curb. The only long-range solution is off-street storage.

A wide variety of methods is being used to provide off-street facilities. Many cities have found the answer in municipally owned and operated lots; others have set up parking authorities to handle the problem on a citywide basis. In many communities, lots have been constructed with community funds and leased for private operation. Careful supervision has been maintained to insure continuity and proper standards. Often, business groups cooperatively maintain facilities for their patrons and personnel. Financing of parking spaces through benefit assessments against properties served has also proved effective in certain localities.

Further Aspects of Fact-Gathering

Complete stock-taking of operational efficiency, to determine where minor improvements can achieve fullest utility is a vital element in long-range planning. It is a rational means of preserving the public investment in the existing network. Equally important, it provides guidance for the optimum operation of new highways, so that they will make the greatest possible return in service for money spent.

A survey of the scope and purpose of the statewide study must necessarily concern itself with economic and sociological as well as engineering factors, and with administrative as well as fiscal aspects. An initial phase is a thorough analysis of all the fundamental elements that influence the demand for highway transportation. These include distribution of population, the state's industrial, commercial and agrarian activities, mineral resources, forestry, and tourist trade. Also considered in this area are the other forms of transportation, all of which depend upon roads to feed them traffic and distribute it at their terminals.

This economic aspect of the study, without attempting to arrive at the precise dollar value of highway service, affords an accurate perspective on the economic benefits of highway transport, one that is essential to the Legislature in its appraisal of taxation problems.

As further background, the historical development of the road net is examined. Previous highway legislation and administrative policies are studied, together with the tax structure past and present. At the same time, a detailed review is made of highway improvements effected through the years by Federal, state, or local action.

Investigation of the actual use of the road system is the next phase. This entails a study of registrations, traffic volumes, types of passenger and commercial vehicles and their characteristic use. The extent of travel within the state is measured, as well as that into and out of the state.

The problem of providing adequate roads and streets would be immensely simplified if travel were always constant. But it isn't. It varies widely, not only on different types of roads but on the same road at different seasons, weeks, days and even hours. The problem is further complicated by special traffic such as that generated by conventions, fairs, elections, and spectator sports. Not only must the different variables be correctly measured, but projections of road-use statistics—in terms of anticipated increases in population and motor vehicle use—must be technically sound.

Following this, the roads and streets are suitably classified; that is, identified according to whether they provide general transportation service or chiefly serve local traffic. The classifications cover state, county, municipal and township roadways, and in the process it is determined which of the roads should come within the province of the respective jurisdictions. This procedure not only makes it possible to assign each group of roads to the government level best fitted to administer it, but also to form a coordinated statewide system that will render the most service at the least cost.

Selection of appropriate standards for road development is next on the agenda. This work is done by special engineering committees formed within the state, county, and city highway organizations. Desirable standards are adopted for new roads to be built in an orderly program of annual replacement; and tolerable standards are

fixed for those which will have to be maintained without major improvement for many years. In adopting standards, comparison in every case is made with the nationally accepted standards.

Charting Several Programs

Finally several recommended programs of development are charted on the basis of all the facts and in conformance with the demonstrated needs of today and of a decade, two or three in the future.

These several programs, covering a longer or shorter period of years, are worked out so that the legislature may have an ample margin of choice. Each periodic program is systematic, detailed and complete in itself, with definite priority assigned to its component elements and a practical rate of improvement indicated. Each program is translated into dollars for construction and maintenance, with adjustment to future cost trends.

The programs and recommendations are ultimately published in an engineering report. This report is written and illustrated so as to make it easily comprehensible to the layman.

Collaterally with the engineering study, a survey is made of revenue sources available to finance a long-term program. This involves appraisal of tax policies and the allocation of funds among the different administrative agencies concerned.

The Federal Aid Act of 1944 authorizes federal participation in the statewide planning studies. The financial and technical assistance thus provided has tremendously stimulated interest of the states in these comprehensive investigations. The studies have given a strong impetus to closer state-city relationships in highway matters, comparable to the federal-state relationship that has produced vast accomplishments in road development on a nationwide scale.

Wide Knowledge and Experience Are Pooled

The new studies make it feasible for the first time for state, county and city highway agencies to pool their experience and knowledge in mapping an arterial plan for the most economical and convenient service of both state and local traffic. The way has now been paved

for local governments to secure counsel, guidance and aid for the solution of problems they could scarcely hope to solve through their own resources.

By no means the least of the benefits to be derived by local highway organizations from the cooperative relationship is the access to a large amount of hitherto unavailable traffic data. These data, apart from their planning value, can be exceptionally useful for improving day-to-day traffic operations. County and city engineering organizations, insofar as they take advantage of this new fund of technical information, will do a progressively better job in operating their systems so as to provide the quality of highway transportation the public demands.

The Use of Polarized Headlights For Safe Night Driving

EDWIN H. LAND

Mr. Land is President of the Polaroid Corporation, Cambridge, Massachusetts, chairman of the board, and director of research. When he entered Harvard in 1926, he was already deep in the problem of polarized light. Three years later he applied for his first patent. In 1932, he announced before a Harvard colloquium a complete solution. The Eastman Kodak Company obtained a license to use the Land polarizers as camera filters, and the American Optical Company obtained a similar license for the use of polaroid materials for sunglasses. In 1936, Mr. Land publicly demonstrated a system of eliminating headlight glare, a system of presenting three-dimensional motion pictures in full color, and variable density windows for controlling brightness of view. In February, 1947 Land demonstrated his newly invented camera that turns out a finished picture one minute after the shutter is snapped, a positive print in permanent form. In World War II, Mr. Land directed polaroid research that perfected precision plastic optical lenses used in devices for seeing at night; developed filters for pre-adapting the eyes of personnel for night duty; devised new types of light-weight stereoscopic rangefinders; developed searchlight filters for signaling at night, and invented an infinity optical ring sight used on anti-aircraft guns and bazookas. In 1935, Mr. Land was awarded the Hood medal of the Royal Photographic Society; in 1937, the Cresson medal of the Franklin Institute, and in 1938 the Scott medal of the Philadelphia City Trusts. In 1947, he received an honorary Doctor of Science degree from Tufts College. He is the author of scientific papers in the field of polarization and in industrial research organization.

IN AN ERA of automobile design devoted to passenger comfort and safety, one still finds a major source of annoyance and discomfort that no manufacturer has begun to eliminate. I have almost never talked with an automobile driver who did not bitterly complain of facing the glare of an oncoming car on the open road.

I say "almost" advisedly, for occasionally one meets the driver

who stoutly contends that night-driving does not bother him. I suspect this indifference is usually due to an insensibility to danger, although individuals vary in physiological reactions.

An extensive program of research carried on at the Polaroid Corporation in Cambridge, at the General Electric Company in Cleveland, and at the General Motors Proving Grounds in Detroit has resulted in a system of automobile headlighting that eliminates glare, discomfort, and danger.

In this development, a formidable succession of problems was met and solved—problems involving both basic scientific knowledge and practical engineering difficulties. It would be well beyond the scope of this article to recite them. Rather I shall discuss the basic difficulties of the present car headlights and explain how the Polaroid system surmounts these difficulties.

I have classified the driver reaction to headlight glare as discomfort. Actually, his experience is substantially more complex than that word ordinarily connotes. He suffers certain direct reactions such as eye-strain and fatigue that produce a definite sense of physical discomfort.

More important, it seems to me, is the psychological reaction to dangers inherent in night-driving at the present time. Even though he may be entirely unfamiliar with the nature of these dangers, he instinctively reacts against them. Because there is no way of avoiding the hazards, the driver strongly dislikes night-driving and for the most part plans his trips to avoid the experience.

Dangers of Night Driving

Actually, these dangers can be accurately identified. They are all directly due to the marginal visibility that current headlighting provides.

Experiments to determine visibility under carefully controlled road conditions were carried out under the direction of Val J. Roper of the General Electric Company. Data on visibility appearing throughout this article are taken from Mr. Roper's findings, but any interpretations or illustrations are my own. Visibility as here used is measured from an automobile operating at forty miles an hour on

an obstacle consisting of a man-sized dummy dressed in dark clothing. This figure, however, is for the operator who is looking for an obstacle and must be reduced by some factor that will offset the observer-driver's complete attention.

The factor Mr. Roper has found most closely represents this average situation is 50 per cent. That is, the unexpected obstacle is seen only half as far as the expected. The applying of this factor produces an effective visibility of only 250 feet. At forty miles an hour on dry roads, the stopping distance is 165 feet,[1] so that under these favorable and simplified conditions the driver's margin of safety is only eighty-five feet. The 165-foot stopping distance is based on the conservative speed of forty miles an hour. In actual driving, the motorist tends to exceed this speed, and since the stopping distance is a function of velocity squared, the margin of safety is quickly exceeded. Once exceeded, the driver is in effect constantly preceded by a danger zone. His safety then depends on the chance that no obstacle lies within that zone.

The conditions outlined here are the best to be expected on an open road. They deteriorate severely when the driver meets another car. Here we have the classic, and up to now unsolved, problem basic to automobile headlighting. Both drivers need to illuminate the road ahead, but in safely illuminating the part of the road where good visibility is most important, it is inevitable that each put a strong beam of light into the oncoming driver's eyes. The present system of upper and lower beam headlights is a compromise solution, but neither a comfortable nor a safe one. For glare is still present, while road illumination is reduced when most needed.

The effect of this situation is indicated in the curve of Figure 1. The ordinate of this curve is what I have called "effective visibility." It represents the maximum visibility reduced by the attention factor discussed earlier. Here, however, an attention factor of 70 per cent has been applied instead of 50 per cent. This higher figure represents Mr. Roper's estimate of the increased attention which the driver brings to bear when he undertakes the meeting of an oncoming car.

[1] The stopping distance of 165 feet is computed using a deceleration rate of 14.5 feet per second plus a driver reaction time of ¾ second.

As the cars approach each other, visibility slowly falls off until at 1200 feet it has been reduced to the figure obtainable with the lower beams. This, then, is the optimum point to switch to lower beams.* During the last hundred feet before passing, the visibility reduces to

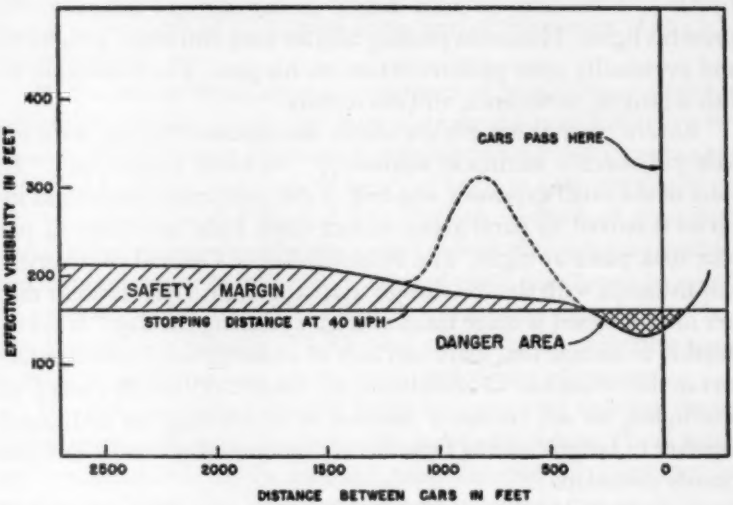


FIGURE 1. Visibility in a two-car meeting with properly used Sealed Beam headlights. Both cars switch to lower beams at 1200 feet.

200 feet, and application of the attention factor results in an effective visibility of 140 feet. It is apparent, then, that during this interval, the driver, unable to see obstacles within his stopping distance, operates his automobile into the danger area previously mentioned.

This discussion and the data presented in Figure 1 are based on optimum conditions; that is, a level road and both drivers switching beams at the proper time. The hazards are greatly increased by improper use of the upper beam. Even the lower beam may illuminate the oncoming driver with a blinding brightness, if a three-degree road pitch is present.

* The sharply rising dotted curve in Figure 1 indicates a special visual ability in some of the drivers tested. Because of their faculty for seeking dark objects silhouetted against the road illuminated by the oncoming car, their visibility is greatly increased for a short distance.

Thus the night-driver is faced with a constantly varying, but always substantial, hazard. At every meeting he is called upon to compromise between trying to look through the oncoming lights, watching the road center for possible sideswipe, or concentrating on the right edge to avoid the road shoulder, or a pedestrian. Guided only by his own instincts, he must decide on the correct moment to depress his lights. Thus each passing calls for concentration, judgment, and eventually some positive action on his part. The inevitable result is fatigue, annoyance, and discomfort.

Results of these hazards are amply demonstrated in the National Safety Council's statistical summary, "Accident Facts—1947." In spite of the small exposure, one-half of the pedestrian deaths and injuries occurred in rural areas, and of these rural accidents 54 per cent took place at night. The National Safety Council summarizes this situation with the conclusion that "the night fatal-accident rate per mile traveled is three times as high as during the day." It is reasonable to assume that glare and lack of visibility are important factors in this situation. In addition to the accidents directly caused by headlights, we are certainly justified in attributing an additional number to fatigue arising from the trying operating conditions previously discussed.

Polaroid Headlights Improve Visibility

In the face of the discouraging picture that the current lighting system engenders, there comes an entirely new principle of road illumination based on the use of polarized light. This headlight system is through the development stage and is technically ready for mass production. Tests have demonstrated that it will meet the requirements of actual road-use.

The system is based on the principle that polarized light is freely transmitted through a polarizing medium the axis of which is parallel to the direction of the light's polarization, but is extinguished* when the axis is at 90 degrees. Bearing this in mind, let us assume that the headlights transmit light polarized at 45 degrees measured

* The residual brightness selected for the headlight application averages about 1/7 of that of today's lower beam.

clockwise from the vertical. The driver views the road through polarizing material whose axis is set in this same direction. Accordingly, he sees the road and other objects fully illuminated. He now meets an approaching car carrying identical equipment. The direction of polarization of the light from its headlights is also at 45 degrees, but in this case, being viewed from ahead, the light reaches the driver's viewer at an angle of 90 degrees to the axis of the viewer. Thus it is extinguished.

In the actual installation, a thin sheet of polarizing material is cemented behind a protective glass plate on the headlight lens. Because of the light losses inherent in polarization, a much more powerful lamp has been designed. It uses 125 watts as compared with 45 watts in present sealed beam lights. Various methods of providing a second polarizing sheet for the driver to look through are possible, but the device now being used is a hinged visor, which may be raised or lowered by the driver. The headlights are not aimed down but are directed horizontally. This logical use of the illuminating beam is made possible because glare considerations are eliminated.

In addition to the polarized lights for open-road driving, the installation is completed by a separate set of city lights. These lights are not polarized. When they are used, the viewing visor may be turned up. These city lights are also used in passing cars on the open road that are not equipped with polarized lights. Thus they are equivalent to the lower beam of sealed beam headlights.

It has been pointed out that the function of the viewer is to extinguish the light from the oncoming car. In actual practice the viewer passes the shorter wavelengths, so that the approaching headlights appear as pale blue discs but of such diminished intensity that no glare is present. The car itself, and the road beyond it, are clearly illuminated. The results obtainable with the Polaroid system are well illustrated in Figure 2. Here again effective visibility has been plotted as a function of the distance between the cars as they approach at forty miles an hour. The curve shows no appreciable reduction of visibility even during the passing phase itself. A comparison of this curve with Figure 1 shows the greatly improved margin of safety.

Figure 3 presents comparative photographs that demonstrate improved visibility during the most critical phase of the passing. The

upper photograph is taken with the cars 200 feet apart, each illuminating the road with conventional lower beams. A pedestrian fifty feet beyond the oncoming car cannot be seen. In the second picture, both cars are operating with polaroid lights. With the improved il-

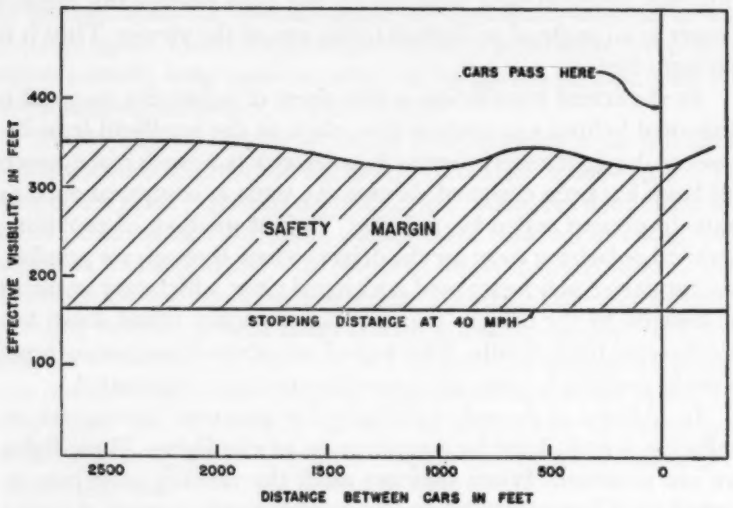


FIGURE 2. Visibility in a two-car meeting with both cars equipped with polarized headlights.

lumination and with glare eliminated, the pedestrian is now clearly visible.

While the polarized headlights achieve their fullest utility during the passing of a car, a collateral benefit of great importance is realized from their increased intensity and horizontal aiming. On the open road with no cars approaching, the driver can raise his viewer and thus substantially improve his visibility. The photographs of Figure 4 illustrate this benefit. The upper photograph shows a pedestrian illuminated by upper beam headlights from a car 200 feet away. A second figure 200 feet beyond can just be seen. The lower photograph shows the same situation illuminated by Polaroid lights. Both men are now visible.

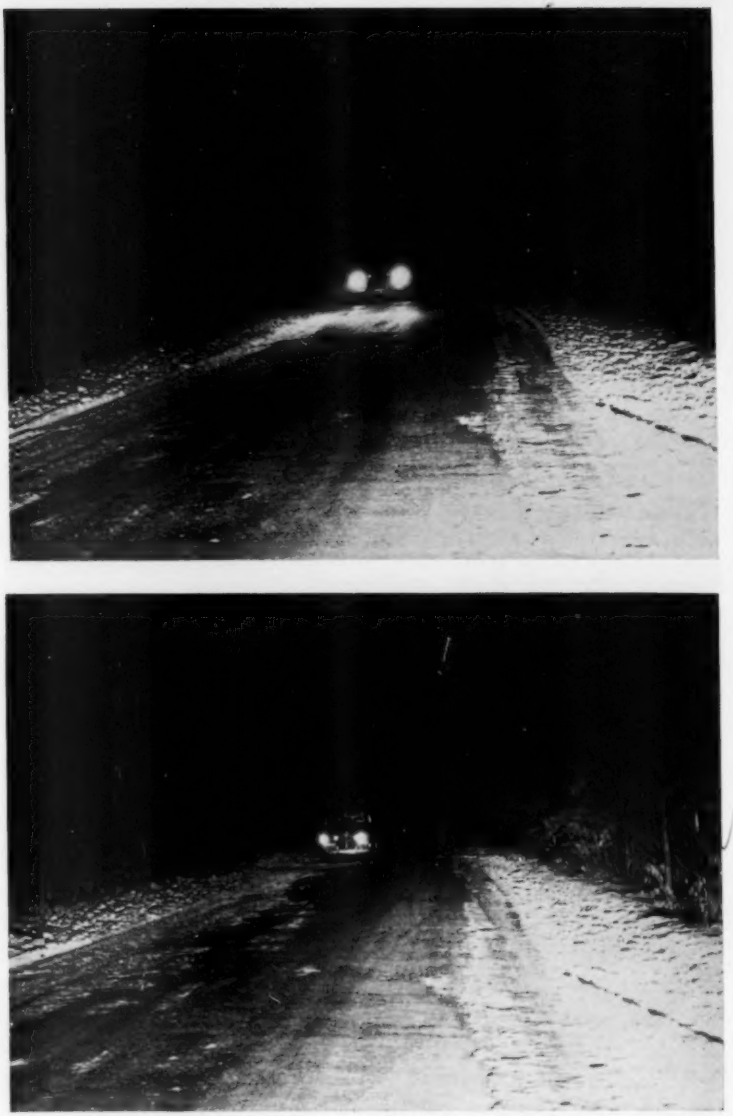


FIGURE 3. Comparative visibility using Sealed Beam lower (top) and polarized headlights (bottom). Pedestrian is present in both photographs.

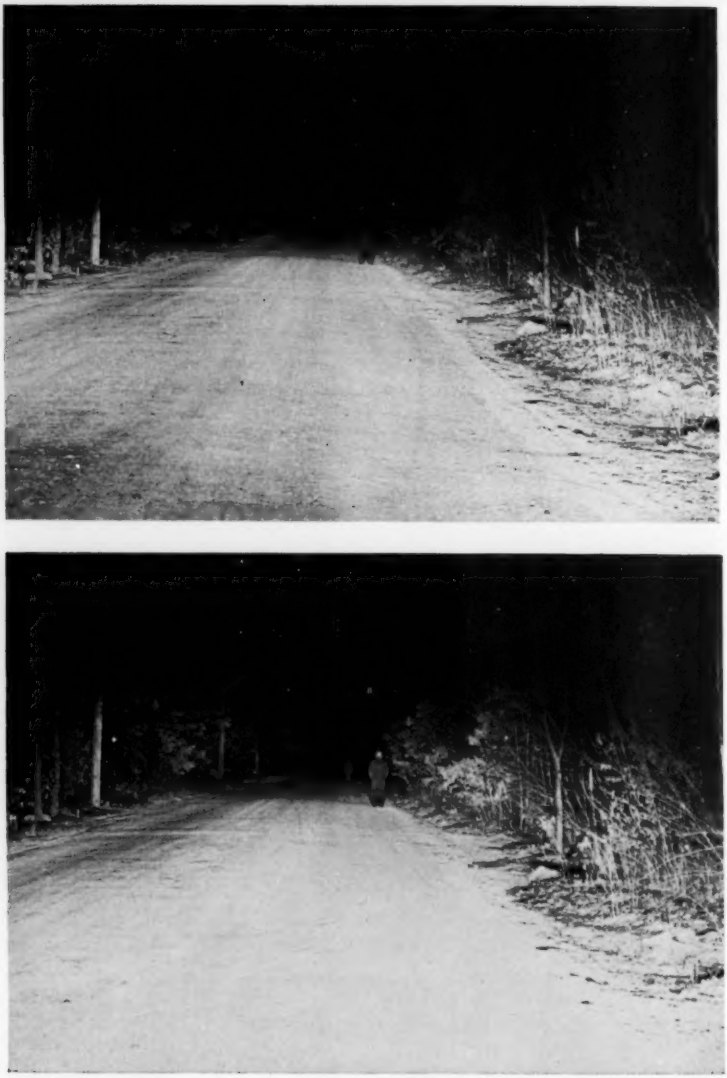


FIGURE 4. Comparative illumination using Sealed Beam uppers (top) and polarized headlights (bottom).

Transition from Old to New Lights

Polarized headlighting achieves its maximum usefulness when all cars on the open road are equipped with it. It is probably true that this optimum situation cannot obtain immediately but must be achieved gradually. How long the period of transition will take is exceedingly difficult to predict. Assuming that all manufacturers adopt polarized headlights at the same time (and the development was carried out with the cooperation of the entire industry), our studies indicate that more than 75 per cent of the single cars you meet at night would be polarized within five years, even if no old cars are converted. The situation is more complex where the meetings involve several cars, and this would tend to extend the period of transition. On the other hand, successful conversion of old cars, for which a system not requiring generator changes is available, might reduce this period substantially. The time element, however, does not in itself constitute any more of a problem than in the present transition to sealed beam lamps. Ultimate results would amply justify the interim period.

A most important question arises when we consider this transition period. What will be the effect of the more powerful lamps in passings that involve old cars? First consider the proper use of the lights. The driver views the road through his polarized visor. He sees an approaching vehicle. If its lights are blue, he knows it is equipped like his own, and they pass each other with full illumination. Should the oncoming lights look white, the driver knows he is meeting an old car. He then switches to his city lights, and the passing is accomplished under the same conditions as with sealed beam lights.

Next consider the situation under improper use where the operator fails to switch to city lights. Road tests under these conditions disclose that while the annoyance of facing the brighter polarized lights is greater than facing upper beams of present lamps, the actual hazard as measured by visibility distances is not increased. In other words, even with improper use, the situation is no worse than when present equipment is similarly mishandled. However, the polarized lights enable the old car driver to get some measure of protection against the careless driver, a protection not available with existing

lights. By equipping his car with an inexpensive polarizing visor he can completely eliminate the glare.

In terms of increased beam candle power, the transition is comparable to the switch to sealed beam lights in 1940. This was accomplished with little unfavorable reaction.

The question of added cost is naturally a matter of interest and importance in a system that will be a part of all automotive equipment. The new lamp is designed to operate at the same voltage as the present one. Thus it does not require a change in battery. Accordingly the increased power is achieved by using a heavier filament. To compensate for the added load a larger generator is necessary. Also heavier wiring is used. Switching is accomplished by a relay to avoid undue voltage drops in the circuit. These under-the-hood changes plus the viewing visor and lamps comprise the additional cost features. The automobile industry estimates that an increase of at least $30 in the retail price will cover these items.

Even if this estimate proves accurate, in terms of current accessory costs, it should not be objectionable. It is of course true that the new car buyer would pay this added sum for ultimate glare-free benefits, not all of which would accrue immediately. However, he realizes at once the improved visibility from the greater illumination. And this he can enjoy under every operating condition that now permits him to use his upper beam.

Polarized Lights Will Lessen Congestion

While I have thus far chosen to emphasize the contribution to safety and comfort the new lights will make, there is a collateral benefit of much importance. Based upon the enthusiastic reaction of all who have had the opportunity to drive cars equipped with polarized lamps in a road test, I feel safe in predicting that when the majority of vehicles is fitted with these headlights, there will be a major change in long-distance driving habits. Many trips now made during daylight hours will be made at night. For, with the major cause of discomfort removed, the motorist will seek to avoid the constantly increasing congestion of highways during the day. The result will be that roads, now primarily a daytime transportation system, will be

used around the clock. The implications of such a change are indeed great in terms of potential savings—savings not alone for the taxpayer in road construction costs, but for the commercial user of motor vehicles to whom hours on the road represent direct costs.

In visualizing the polaroid system in general use, I frequently think in terms of driver-comfort. It is not too far afield to draw a parallel with the self-starter. Certainly here was a device that eliminated many broken arms and strained backs, yet today we do not regard the self-starter as a safety measure but as a major revolution in convenience. Similarly, I believe that when polarized lights are standard on all cars, we will regard them less in terms of a reduced accident rate, and more for the part they play in making night automobile travel as comfortable and commonplace as night-travel by air or train. Thus a more *comfortable* driving would result directly from a *safer* driving.

This Business of Safe Driving

T. J. CARMICHAEL

Mr. Carmichael is the Experimental Engineer of the General Motors Proving Grounds. Prior to that, he was for eleven years head of the mechanical engineering department. He is the author of "500,000 Miles of Experience" and "Operating Characteristics of the Modern Automobile."

SOME forty miles northwest of Detroit, Michigan, a few miles west of the Village of Milford, lies a tract of 1,268 acres of land known as General Motors Proving Ground. General Motors bought the land in 1923 to provide a place where private roadways could be built and maintained for testing automobiles under actual operating conditions.

Prior to the development of the Proving Ground, the automobile divisions of the corporation had been forced to do a great deal of their work on public highways. That procedure was unsatisfactory for two reasons: lack of control over ever-changing road conditions, and hazards to both test drivers and the general public.

This organization has developed into one of the world's largest outdoor automobile testing laboratories.

The Proving Ground is well known for its contributions to engineering of the modern automobile. Certain facts pertinent to the automobile other than strictly engineering data, accumulated by the Proving Ground have received little publicity.

The accident record of the organization, for instance: two fatalities in 97,000,000 miles, from the day the first car rolled along its roadways. Compare this with the average death-rate of 11.5 per 100,000,000 miles on the public highways in the last ten years and when one considers the type of driving required for a great many of these test-car miles, the record becomes even more impressive. One advantage in safety that the Proving Ground has over public highways is somewhat lower traffic density than is found on highways in the more thickly populated areas.

Test-driving goes on night and day—winter and summer, stormy

or fair. As in the theater, "the show must go on." In addition to this, a great deal of the driving is done on schedule, some of which is far from a cruise down the boulevard. Some schedules require the periodic reading of test instruments. Speeds required by the test vary from a slow idle to the neighborhood of 100 miles per hour in some cases. Some tests require special skills such as the maximum speed at which a curve can be negotiated, the deliberate swerving of a car at high speed to test its ability to straighten itself out when the steering wheel is released, high speed tire-blowout tests and stopping-distance tests. These sorts of tests, and many others, are part of the daily life of Proving Ground drivers.

The road system of the Proving Ground is typical of public highways. With the exception of a Belgian Block (cobblestone) road, the surfaces are concrete, asphalt, gravel, brick and dirt. The design is typical of highway practice except for a 3.8 mile speed-loop with super-elevated curves and for numerous sharp curves and grades in excess of those commonly met with outside. Maintenance is typical of the best highway practice. In winter, there are considerable snow and sleet. They are removed as rapidly as possible. But driving goes on under these conditions; hours lost because of weather is small.

Driving rules on the Proving Ground are few and simple. With few exceptions, they are like those of the public highway. One advantage the Proving Ground has lies in the large percentage of one-way highways. In every case where it is possible to do so, traffic flows in one direction only. Enforcement is in the hands of a supervisory group assisted by a small Plant Protection Department. There is no road patrol. And except on streets in close proximity to buildings, there is no speed limit.

One may therefore ask, "Why are accidents so rare on the Proving Ground?" Immediately many would say, "Because there are only expert drivers on these roadways." This is true, but how did this organization acquire none but expert drivers? By no means is all the driving done by the test-driver. Many miles are driven by engineers, executives, and others whose business is not primarily driving. These people, it may be said, are experts: they have great knowledge of an automobile. Undoubtedly that fact contributes in some degree to safety. But another factor has been the keystone of the safety record

at the Proving Ground. It is a sort of unwritten law over years of operation—"DON'T HAVE AN ACCIDENT." To Proving Ground drivers, an accident for any cause whatever, either on the grounds or on the public highway, is disgrace. If you work at the Proving Ground, and come back from a drive with so much as a dented fender, you are immediately the target for all manner of ribbing.

"What's the matter, can't you handle an automobile?"

"Why not go out and take lessons in driving?" "Why not get a wheelbarrow and practice on it awhile?"

To this type of thing one is subjected for days, or weeks and months. Any excuse heaps coal on the fire. To these people, a bad situation is a challenge to a driver's skill. A bad situation recognized in time and successfully maneuvered is the mark of a good driver. To fail to realize the situation's existence, or to fail to get out of it means you lack skill and judgment. To drive a car thousands of miles without an accident, if no predicaments occur, is no test of ability. The only time a driver is tested is when a problem arises. Fortunately, no one goes out hunting bad situations. Enough of them occur in the course of events. At the proving grounds where *no* alibis are permitted, everyone does his utmost to develop skills and judgments that serve him well in emergency. To violate a rule on the Proving Ground, even if management never heard of it, is to bring an avalanche of absolute abuse on your head from every driver who sees or hears about it. Repetition leads shortly to dismissal.

Management takes a similar view of accidents and violation of rules. Little importance is placed on *why* you had an accident—unless it was due to mechanical failure of the car. A mechanical failure, of course, provides data to help build safer automobiles and is in most cases some excuse for the driver. Other than that, the important things are: You had an accident, and we can't have accidents on the Proving Ground; Your skill and judgment may not be up to requirements here; repetition may dismiss you from the job.

On the other hand, no driver is asked to drive a test he does not feel satisfied he can handle. No criticism is directed at anyone who refuses to drive a test he considers unsafe. In fact, it is generally looked upon as good judgment. If this occurs, the most experienced driv-

ers are given a chance at it. If they think it is too hazardous, the test is revised to make it safer, or it is dropped.

This system is basically like that under which the pubic drives, except that emphasis at the Proving Ground is put on not *having* an accident rather than *why* you had the accident. We do not believe in luck, good or bad: and since there are people who do not have accidents, *there must be something wrong with the driver who has them.*

Next let's look at the typical Proving Ground driver, and the effect the system has upon him. Consider first, the group whose principal business is test-driving. Most of them came from surrounding farms or villages. None on arrival was expert in any sense of the word. They represented the driving public. The new man is given no formal driver-training course. The foreman teaches him a few basic rules and the road system. Then he is assigned to ride with, and change off with, an experienced driver for a few days. Here his education in driving really begins. This experienced driver knows his job and will do anything he can to help the new man. During this time, the new man is under close observation. If he displays ability, he is assigned a drive-job that does not require too-expert handling. As his skill and judgment develop, he is given better jobs and more pay. Throughout his experience he has continually before him the unwritten law "Don't have an accident," and the example of older drivers who daily drive difficult tests that require skills he finds he cannot approach. Skills which to outward appearance seem simple, such as holding the speed of a car to within $\pm\frac{1}{10}$ miles an hour for appreciable distances under varying loads. Like most private drivers, the new test-driver comes to the Proving Ground believing he is just as good as the next fellow in handling an automobile. A few days experience usually convinces him there are things he could learn; and if he progresses, he eventually concludes he will never stop learning.

He is usually amazed to find many things about the behavior of an automobile that he never heard of or experienced in years of driving on the public highway. He has never been asked the question, "Where do you look when driving in traffic? Where, at high speed in the country?" He finds it necessary to watch near-by vehicles and objects while in traffic at slow speeds. But at high speeds in the coun-

try his line of sight, he discovers, should be on the horizon much of the time. At high speeds, a driver must have ample time to recognize a hazardous situation developing and to do something about it. Practice of this also develops a required skill in keeping your car in a lane under good control by *feel,* which serves you well in case you are suddenly blinded by lights, or by a splash of mud or water.

Many private drivers have never gotten over the habit of keeping their car in its lane by watching the road a few feet ahead of the car. This is particularly true of people who do most of their driving in the city. It explains to a degree why such people are prone to get involved in an accident when driving at high speeds in the country. On the same basis, the high speed country driver is more liable to get into trouble in the city. Every condition of driving requires special technique and skills. Therefore if you are in the habit of driving under a certain condition, you should exercise added caution when faced with a different condition.

Our driver is told emphatically that the most hazardous type of accident is a head-on crash either with an on-coming vehicle or an immovable object. He learns it is better to roll a car over than to involve it in a head-on collision. A modern car can flat-spin on a smooth pavement without rolling over, providing it is not tripped by a hole or a high pavement joint. While this is a hazardous procedure, it can—and has been—used as a last resort to avoid a more hazardous accident.

Our drivers learn that when the wheels are locked by the brakes, the driver no longer has any control over the direction of travel of the vehicle. Many people think of a broken steering mechanism with horror, yet in an emergency they "freeze the brake" till they lock the wheels. In such a condition, they might, figuratively speaking, just as well tear off the steering wheel and throw it out of the window. Sliding wheels also do not produce the shortest stopping distance. The shortest possible stop is attained by keeping the braking force just under the point of wheel slide. This requires study and practice. Under slippery conditions it can best be done by a rapid intermittent application completely releasing the wheels and completely stopping them each cycle.

Many drivers are surprised to find that a blowout, even at high

speeds, is not an inherent reason for an accident. The possible exception to this might be in dense traffic where a small side-drift from your lane could side-swipe another vehicle. The effect of a blown tire is to cause the car to drift toward the side that is flat. If the driver calmly steers against this drift very much as he would against the drift caused by a crowned road nothing alarming will happen. Accidents from blowouts are usually brought about by a panicky whirling of the steering wheel, which results in over-correction of the path of travel. This in turn causes the driver, again in a panic, to whirl the wheel in the opposite direction again oversteering. Two or three cycles of this and the car is out of control—and would be even if no flat tire were involved. In addition to this, too many people are prone to "freeze on the brake" with resultant loss of control. A large percentage of the accidents "caused" by blowouts, would never occur if people learned to drive their cars calmly to a stop.

Our new driver hears a great deal about "oversteering" and "fighting the wheel;" how to judge whether or not he has these bad habits, and if so, how to correct them. He learns to practice taking a car around curves with the minimum movement of the steering wheel, making a smooth consistent path. If he must make numerous changes in his steering on a curve, he is oversteering and "fighting his wheel." Practice and study will eventually develop the skill to negotiate curved courses with practically no noticeable movement of the wheel.

Why is this worthwhile? Because sooner or later he will misjudge a curve and find himself in the curvature at a speed a little too high for comfort. If he has thoroughly schooled himself in correct steering, he will simply slowly correct to the proper degree, and negotiate the curve successfully. If on the other hand he is in the habit of oversteering, he is likely to do so in an emergency with results somewhat similar to those of panicky handling.

He learns certain other defences for himself in the case of emergency cornering. It is of some comfort to him to know that once he has established the car in a curved course of constant radius, there is not enough power in the engine to accelerate it to the point where it will go out of control. When once in the curve he does not have the urge to let up on the accelerator, which tends to make the car un-

stable because of decelerating forces introduced when the power is cut off. As a last resort, particularly when he comes unexpectedly to a slippery road surface, a driver at the Proving Ground learns the art of "whipping" the car around a corner.

This is difficult to master. It appears to the layman like "wheel fight." As a fact, it is quite different. It constitutes establishing the shortest curve the vehicle will stand and then adding to that a series of short sharp jerks of the steering wheel rapidly executed. If skillfully done, the result of this is so far as can be seen a smooth constant path. But the radius of turn is somewhat shorter than can be attained otherwise. Skilled drivers speak of *"turning a corner before you come to it."* This is simply a case of anticipating the curve and steering the car on a transition course into the actual curve. Once mastered, it results in smoother and safer cornering.

There are also many skills to be learned about proper handling of the accelerator. Under certain conditions, knowledge of this may become an important part of steering the car. It is beyond the scope of this article to describe all the knowledge and skills the professional test-driver develops. Complete description of these would constitute a text book on driver-training. The few examples briefly described here are given to illustrate the point that to become a really skillful driver requires knowledge and practice far beyond what the driving public usually acquires.

Some argue that the driving public does not require training of this type, and that such training would tend to make them drive faster and therefore more dangerously. But experience with Proving Ground drivers does not bear this out. The opposite in general is the case. As our drivers gain knowledge of the behavior of a car under various conditions, and acquire skills necessary to successful driving, they become less inclined to take a chance. True, they cover greater distances in a given time but in doing it they display good judgment in determining when and where to use speed without danger. Comparison of the test-driver with the driving public convinces one that the biggest single step toward safety on the public highways would be a universally effective driver-training program. Such a program in itself is only half the battle. The other half is an incentive to become a skillful driver, a means of distinguishing a skillful driver from an

unskilled one. Borrowing from Proving Ground experience, we might rate all drivers' skill by their performance in avoiding accidents regardless of circumstance.

At present we give entirely too much publicity to the poor driver, and so little to the driver who does a good job. People value recognition and will make considerable effort to gain it. Recognition alone, based on years of accident-free driving regardless of circumstance, might supply considerable incentive to develop the skill and judgment required. A further incentive might be provided by placing speed limits and other controls on drivers who have bad records. Certainty that your becoming involved in an accident would automatically place you under restrictions might create a good deal of interest in avoiding accidents. Speed limits on an incompetent driver are much more logical than placing them on a road or state. This would be no more discriminatory than aircraft-pilot licenses that limit types of flight.

We have in the driving record of the Proving Ground an example of what can be attained by safe driving practices. The keystone of the success lies in the precept that accidents are the result of bad judgment and lack of sufficient skill. Therefore, accidents are outlawed regardless of circumstance. From this develops a strong desire to become skillful drivers. And opportunity and help are provided. This is the blueprint of an industrial program of safe driving that can be redrawn to fit our public highways.

Billboards and Zoning

ARTHUR H. THOMPSON

Mr. Thompson is a practicing attorney in Pittsburgh, Pennsylvania. He is a member of the Allegheny County Bar Association. The following article was prepared as a special thesis under the direction of Vice-Dean Charles B. Nutting of the School of Law of the University of Pittsburgh. The purpose of the study has been to survey the political, economic and legal problems involved in the efforts of state legislatures to control or prohibit the use of state highways for advertising purposes.

To some 60 million motorists who drive America's 37 million vehicles over 300 billion miles each year, the old cry, "There ought to be a law against billboards," is appealing, but the problem it presents is baffling. They know that America has the greatest highway system in the world and that states advertise their beautiful scenery. Yet year after year, the number of billboards is allowed to increase.

Is there any wonder that many of these travelers are asking, "Isn't there something the states could do about this problem?" Many legislatures are considering roadside legislation, and practically *all* states will consider it in the not distant future. It is well, then, to investigate the political, economic, and legal problems this question poses.

Thirty years ago the "billboard problem" did not exist. When few well-paved rural highways and only 64,000 motor vehicles were in use, billboard advertising was largely unprofitable. But when the public began spending millions and then billions of dollars for highways, and millions of motorists took to these roads, outdoor-sign companies increased in great profusion.

3000 Billboards in One County Alone

The rise of billboards as a "problem" has been gradual. No one objected thirty years ago, but today the growth of outdoor adver-

tising is greater than any other form of advertising, including radio. Today in Allegheny County, Pennsylvania, one advertising company alone owns 3000 standard size billboards. U. S. Route 1 north of Philadelphia illustrates the effect of billboards on the landscape. Travelling at fifty miles an hour, the motorist passes seventy signs every seventy seconds, or one a second! Figures from Route 1 in other states reveal similar conditions: on a sixteen-mile stretch east of the New York line, there are 1800 signs, or 112 a mile.

Going south on Route 1, figures reveal that 28.5 miles of the Baltimore-Washington Boulevard pass between 2450 billboards and signs. On the 300 miles of Route 1 in Florida, outside of towns, there are more than 1000 billboards, 6000 signboards, and 14,000 signs on trees and business places.[1] This amounts to a 100 per cent increase within a six-year period! The outdoor advertising industry has now reached such proportions that its operations are affecting the interests of others.

Those whose interests we should discuss include: the outdoor advertising companies, the farmers on whose land billboards are erected, adjacent land owners whose land evaluation is affected, and the state, which is interested because of public safety and because of its property interest in the public highways. The advertising companies are now well organized concerns with millions of dollars invested in offices, equipment, and billboards. The industry represents an estimated capital investment of $125,000,000 and employs 33,000 men and women. The yearly volume of business is approximately $50,000,000.[2]

Unlike the billboards erected during the early days of the industry, those now erected are of sturdy construction. The standard-size board is of a heavy timber, braced against the wind and covered with sheet metal at an average cost of $300 apiece. It is important to remember that no legislation now contemplated would amount to a confiscation of the industry. Most highway bills make provision for amortization, or give sufficient time for removal to areas where billboards would be permitted. Even though all billboards were to

[1] Survey conducted by National Roadside Council, Inc., New York City.
[2] Outdoor Advertising Association News, January 1939 issue.

be banned from rural highways (state highways), this would affect less than 10 per cent of the billboards now in existence;[3] for 93 per cent of the billboards are located in urban areas.

The interest of the farmer from the standpoint of economic return from billboards is slight. Only a small percentage of our farmers live on the main highways where advertising is economically sound. For the use of a billboard site, the farmer is usually paid about $10 a year. There are a few large, strategically located billboards that bring $40 a year.

In spite of the small return to the farmer, he is often the first to complain about highway laws that look to the control of billboards. This opposition arises first from the farmer's dislike of regulation of all sorts, and second from the clever public relations tactics of the advertising industry.

When Billboards Are a Safety Hazard

Adjacent property owners are also interested in the problem. Billboards are one of the important contributing factors in the creation of what are known as "ribbon slums." These slums, to be found in every state, consist of thousands of billboards, shacks, gas stations, hot-dog stands, and junk yards, stretching in an unending procession along our once scenic highways. The entire effect of this free development of highways is depreciation of adjacent property for other purposes.

Finally we have the interest of the state to take into consideration. Of highest importance is the safety factor. It is obvious that billboards placed on curves and at intersections could be and are hazards to driving. But what of the other ones—do not they distract the driver as well? Advertising must be seen and comprehended to be successful. Supposing a group of billboards causes only three seconds' inattention. In those three seconds, an automobile travelling 50 miles an hour would travel 219 feet. In 1946 there were over 33,900 automobile deaths on American highways and a grand total of 1,300,000 injuries.[4] Failure to give strict attention to the road is high on the

[3] Estimate by the Pennsylvania Roadside Council, Inc.
[4] Figures compiled by Travelers Insurance Company.

list of causes for automobile accidents. Should any distracting influence be allowed to remain? There are ways enough at best that a driver may have his attention distracted. If the legislature, upon investigation, should believe that these billboards are in fact a safety hazard, then this in itself would be a substantial ground upon which to base a statute.[8]

The state has a substantial property interest in the beauty of the landscape. The public has at enormous expense built a fine system of roads through the most beautiful parts of our state. Scenic areas have been set aside for visual enjoyment in Pennsylvania, the legislature set aside $150,000 for the building and maintenance of Roadside Rests. The Tourist and Recreational Bureau of the Department of Commerce of Pennsylvania spends $225,000 a year in developing and servicing our tourist industry which is largely based on the beauty and charm of the Pennsylvania countryside. Vacationists coming into the state spend approximately $500,000,000 per year.

Under these circumstances, to regulate the construction of bill boards to protect the beauty of the landscape would not be the use of the police power merely to protect the aesthetic. It would be the protection of a substantial property right in the state, of which the aesthetic happens to be an essential part.[9]

Having investigated the political and economic background to our problem, let us approach it from a legal standpoint.

Legal Problems Involved

Until recently, all cases on the control of billboards have proceeded upon the theory that a regulation of billboards is a restriction upon the use of private property. If this regulation cannot be justified as a proper use of the police power, it is a taking of private property without due process of law! Aside from the cases based upon public

[8] In General Outdoor Advertising Co. v Dept. of Public Works, 289 Mass. 149, 193 N. E. 799 (1935) the conclusion of the Master was that billboards were a safety hazard.

[9] City of Miami Beach v Ocean and Inland Co., 147 Fla. 480. 3 S. O. 2d 364. In this case the court upheld a zoning restriction based on the aesthetic saying. "It is difficult to see how the success of Miami Beach could continue if its aesthetic appeal were ignored, because the beauty of the community is a distinct lure to the winter traveller." This same reasoning is applicable to the case of summer tourists who are lured to Pennsylvania (and other such states) because of the beauty of the rural countryside.

safety, billboard acts are usually labeled as attempts to use the police power to protect the aesthetic.

It is a rule of law in nearly all the states that the police power will not be extended to protect the aesthetic. These courts reason that the aesthetic sense is disassociated from any relation to the public health, morals, safety, or general welfare. But this rule of law is gradually losing its magic, and it is reasonable to believe, on the basis of the cases about to be discussed, that within a short time it will have lost practically all its force. There are two main reasons for making this assertion: first, our understanding of the use of the police power is changing, and, second, the conditions upon which the rule was based no longer exist.

There are numerous decisions in all the states and in the Federal courts, attempting to define the extent of the police power. These attempts serve to illustrate that the meaning of the term is elastic and depends upon the needs of the people at the time the regulation is imposed. There has been a rapid extension of the police power within recent years to points that in earlier times were considered entirely within the field of private liberty and property rights.[7]

Chancellor Kent defined the police power as the authority of the state "to regulate the unwholesome trades, slaughter houses, and operations offensive to the senses." In 1911, the Supreme Court of Pennsylvania held the police power to be the right to prescribe regulations for the order, peace, health, and protection of the comfort, convenience, and morals of the community. It was expressly stated that the fourteenth amendment to the Federal Constitution was not designed to interfere with the exercise of that power by the State.[8] In 1914 the Michigan Court stated that the police power has as its object the improvement of social and economic conditions affecting the community at large. The power was to be applied to bring about the greatest good to the greatest number, and was to be exercised as varying social conditions demanded correction.[9] The

[7] The rapid extension which began in the last decade may be illustrated by the following cases: control of the price of milk,—Nebbia v People of the State of New York, 291 U.S. 502. 78 L. E. 940, (1934),—wage regulations,—West Coast Hotel Co. v Parrish 300 U. S. 379, 81 L. E. 703, (1937),—marketing quotas for crops, Mulford v Smith, 307 U. S. 38, 83 L. E. 1092, (1939), etc.

[8] Commonwealth v Plymouth Coal Co., 232 Pa. 141, 81 Atl. 148 (1911).

[9] People v Bayee, 183 Mich. 259, 149 N. W. 1053 (1914).

A. Scenic Beauty and Safety Vision Both Preserved

B. Outdoor advertising at a Highway Curve

United States Supreme Court has stated that the police power extends to all the great public needs.[10]

A Change in Police Power Precedents

Applying the police power to the billboard cases, we find a similar change over the years. The law as originally understood in all the states was most clearly stated in *City of Passaic* v *Paterson Bill Post, etc. Co.*, 72 N. J. L 285, 62 Att. 267 (1905) thus:

> Aesthetic considerations are a matter of luxury and indulgence rather than of necessity, and it is necessity alone which justifies the exercise of the police power to take private property without compensation.

During the next two decades various courts discussed the fact that social standards conform to new ideals. In other words, as our sensibilities become more refined, that which at common law did not offend, we may now find to be obnoxious, and may in law consider a nuisance. Just as nauseous smells come under the ban of the law, so should ugly sights and discordant surroundings, which may be just as distressing to keener sensibilities.[11]

The first step forward occurred when the courts began to recognize the aesthetic when it was coupled with other substantial grounds, such as public safety or general prosperity. In 1927 Liggetts' Petition was authority for this principle in Pennsylvania and was used in upholding billboard restrictions in residential districts under zoning laws for urban centers.[12] In 1930 the Supreme Court of Indiana upheld an ordinance of the City of Indianapolis that provided that no billboard could be located within 500 feet of any park, parkway, or boulevard. The court reasoned that the public had spent its money to make one section of the city beautiful to the eye and private interests should not be allowed to destroy that beauty.[13]

Within the last six years there have been decisions in New York,

[10] Noble State Bank v Haskell, 219 U. S. 575, 31 S. C. 299, 55 L. E. 341 (1911).
[11] State v Harper, 182 Wis. 196 N. W. 451 (1923).
[12] Liggetts' Petition, 291. Pa. 109, 139 Atl. 619 (1927).
[13] Outdoor Advertising Co. v Indianapolis (1930), 202 Ind. 35, 172 N. E. 309 (1930).

Pennsylvania, and California, which were based entirely upon protection of the aesthetic. In each of these decisions it would have been possible for the court to have decided the question on the basis of Liggetts' Petition (supra), but the court chose to state specifically that aesthetic considerations were sufficient to base an exercise of the police power.[34] Both the Pennsylvania and the California cases are lower court cases which show the trend of decisions in these two states. Both these cases would have been appealed within three years if the billboard interests had the least hope of their being reversed.

The Pennsylvania opinion reviewed many of the cases on this subject, including those that were discussed above, and found that the development of the law was now such that aesthetic considerations *alone* were sufficient to support an exercise of the police power. The California decision is especially significant because it permits the extension of the *zoning* principle to rural areas to protect the *natural beauty of the landscape.*

Three Supreme Court Opinions

Fortunately we are not limited to lower-court cases to support the thesis that the state may regulate billboards under its police power. There are three strong opinions from the Supreme Courts of the Philippines, Massachusetts, and Vermont, which are now being used by the advocates of roadside control as authority for the constitutionality of billboard legislation. Each of these cases reasons that what is being regulated is *not the use of private property,* but rather the attempt of *private interests to use the public highways for commercial purposes!*

In Churchill and Tait v Rafferty (the Philippines case)[35] the statute stated:

> If after due consideration the Collector of Internal Revenue shall decide that any sign, signboard, or billboard is offensive to the sight or is otherwise a nuisance, he may by summary order direct the removal of such sign, signboard, or billboard . . .

[34] Preferred Tires Inc. v Village of Hempstead 19 N. Y. S 2d 374 (1940). Commonwealth v Trimmer, 53 Dauphin 91 (Pa. 1942); Monterey County v Bassett, No. 16909, Superior Court of Monterey County, Calif., cited in Commonwealth v Trimmer, 53 Dauphin 91.

[35] Churchill and Tait v Rafferty, 32 Philippine Reports 580.

The plaintiffs had sought an injunction against such removal and admitted that the billboards in question were offensive to the sight. The sole question, then, narrowed down to whether the removal of billboards merely because they offend the aesthetic was taking property without due process of law. The court held that no constitutional rights would thus be violated.

Judge Trent's language has been quoted in other cases and clearly states the nature of the plaintiffs' property interest:

> Ostensibly located on private property, the real and sole value of the billboard is its proximity to the public thoroughfares. Hence, we conceive that the regulation of billboards and their restriction is not so much a regulation of private property as it is a regulation of the use of the streets and other public thoroughfares.

The Constitution of Massachusetts, in Article 50, states, "Advertising on public ways in public places and on private property *within public view* may be regulated and restricted by law." Pursuant to a statute authorizing the Department of Public Works to license billboards, the following regulations were adopted. No billboards could be erected,—

1. In scenic areas.
2. Within 150 feet of an intersection.
3. Where the majority of buildings in a block are residential on both sides of the street.
4. Within 50 feet of any highway.
5. Within other distances depending upon the size of the billboards.

In *General Outdoor Advertising Co.* v. *Department of Public Works* (1935)[28] the Supreme Court held that these regulations were designed to promote safety of travel upon the highway and enjoyment of resort to public parks, to shield travellers upon the highways from unwelcome intrusions of business appeals, to protect property from depreciation, and to make the Commonwealth *attractive to vistors* from other states as well as to the citizens of Massachusetts.

Chief Justice Rugg stated that it was not necessary that the regulations should be based upon either public safety or the pro-

[28] General Outdoor Advertising Co. v. Department of Public Works, 289 Mass. 149, N. E. 799 (1935).

tection of travellers from the unwelcome intrusion of advertising. Protecting the landscape from defacement promotes the public welfare, and thus considerations of taste and fitness may be basis for granting or denying permits for advertising devices. The regulations were found not to violate Federal due process of law.

The Principle of Real Property Law

The most recent case favorable to billboard regulation is *Kelbro, Inc.* v. *Myrick*, 113 Vt. 64, 30 Atl, 2d 537 (1943). This case is extraordinary, for it determines the validity of the Vermont billboard law, not upon any theory concerning the aesthetic, but rather upon an old principle of real property law. This approach to the billboard problem was first enunciated in an exhaustive article entitled Billboards and the Right To Be Seen from the Highway by Ruth I. Wilson in the Georgetown Law Journal.[17] This study was made use of by the public officials of the State of New York, who were granted leave to file a brief as *amici curiae* upon the side of the public interests.

Every owner of land upon a public highway is said to have two classes of rights in the highway; namely, those he has in common with the general public, and those he has by virtue of owning land contiguous to the highway. These latter rights are termed easements, and include the rights of ingress, egress, light, air and view. These easements arise by operation of law because of the public policy of the development of land. They are essentially easements appurtenant, for they exist solely for the benefit of each particular plot of land. The highway is said to be the servient land, burdened with the easements for the benefit of the dominant abutting land. It is a principle of real property law that easements appurtenant cannot be separated from the land, cannot be used for the benefit of other land, or for the profit of others, and the burden of such easements cannot be increased. So it follows that the owner of this land cannot sell his right to be seen from the highway to an advertising company, and any attempt to advertise anything other than that land or products sold on such land is an *excess user of the easement.*

[17] Wilson, Ruth I., Billboards and the Right To Be Seen from the Highway, 30 Geo. L. J. 728.

Thus, a law that regulates or restricts billboards does not deprive either the owner of the land or the advertising company of property without due process of law because *the claimed property rights do not exist*. You cannot deprive a person of that which he does not have! In effect, the advertising companies are making a commercial use of the highways and are not asserting any natural right. The state in its absolute control of the public highway may extend the privilege of advertising or completely deny such privilege. There is no inherent right to use the highways for commercial purposes. It was the position of the Vermont Court (by unanimous decision) that considerations of the aesthetic did not enter into the question, as this was simply a use of the highway analogous to the use of it by common carriers, and this use may be controlled by the state.[18]

Authority Does Exist for Well-Drawn Billboard Law

It can be seen from the foregoing discussion of the legal aspects of our question that there is considerable authority to sustain the constitutionality of a well-drawn billboard law. It is always difficult to predict what the Supreme Court of any state will do on a legal problem that is changing so rapidly as this one, but the trend is clear. As an example, the Pennsylvania Court could take any number of views. It is most likely because of the trend of the decisions both in the lower courts in Pennsylvania, and because of precedent-setting cases in other jurisdictions, that the Supreme Court will permit the extension of the police power to protect the aesthetic.

The question is no longer an academic one, that can be settled by pulling out the proper legal dogma. There are conflicting interests that must be adjusted. The economic interests of one very small sec-

[18] State v. Gamelin, 111 Vt. 245, 13 Atl. 2d 204 (1942); also Valentine v. Chrestensen, 316 U. S. 52, 62 S. C. 920, 86 L. E. 1262 (1942); as to which activities are in derogation of the right of public user is a matter of legislative judgment. It was argued in the Vermont case that putting outdoor advertising in a separate class from other businesses, and especially as regards owners of land that advertise their own products, was to deny equal protection of the laws.—"Billboards present problems in themselves and can properly be put in a separate class from buildings, fences, etc. . . ." Thomas Cusack v. Chicago, 242 U. S. 526, 37 S. C. 190, 61 L. E. 472 (1917). According to Packer Corp. v. Utah, 285 U. S. 105, 52 S. C. 273, 76 L. E. 643 (1932), billboards are in a class by themselves because they thrust themselves upon the public—you can turn the radio off or refuse to buy a newspaper.

tion of our economy are in serious conflict with both the property interest of the state and with the social desires of the public. This should be sufficient to permit the use of the police power. *But* even though the Supreme Court is not willing to see the police power extended where only the aesthetic is involved, a billboard law could still be sustained under the doctrine of Liggetts' Petition (supra).

In other words, we may allow the aesthetic to be considered where there are also other substantial grounds upon which to base the law. In this case the substantial grounds would be, first, public safety, and second, a property interest in the state, in the maintenance of its highway system, and in the protection of a vast tourist trade. Having determined that a billboard law can be sustained in the courts, we may now consider what steps should be taken, and what form that law should take.

No matter what form the billboard law may take, the first consideration must be how to overcome the difficulty of getting such a measure through the Legislature. The billboard industry is organized on a national basis, and always exerts great influence in any state capitol where a billboard law is contemplated. It is a simple matter to have hundreds of letters sent to the various members of the legislature asking them to defeat a particular bill. The same procedure has been successful in the case of township and county measures. The first step therefore, must be the education of the citizens as to the advantages of the legislation, how it will work, and when it will be up for consideration. In some states it may be simpler to bypass the legislature by having a constitutional amendment voted on at the next general election. Such amendment would merely confer power upon a particular branch of the government, such as the Department of Public Works, to regulate or restrict billboards within view of the public highway.

Significant Billboard Tax Suggested

Billboard laws now in effect do not accomplish the purpose for which they were intended. These laws usually regulate the size of billboards, and provide for set-backs from the highways varying

from 50 to 200 feet, according to their size. Every board is licensed for a small fee, varying from $1 to $4. These small fees tend to discourage the erection of small signs but have no effect upon large ones.

These fees, designed to cover the administration of the act, must have some reasonable relation to the cost of such administration. But there is no reason why a state could not pass an act which would be upheld as a genuine revenue act aimed at the privilege of conducting an advertising business and assess a large tax upon each billboard.[29] The tax here would not be so high as to confiscate (which might be declared invalid under the state due-process clauses), but would be high enough to keep the billboard industry from expanding until such time as an effective billboard law can be passed.

The most effective way to clear our highways of billboards is to zone all our highways. That is, we would extend to the rural areas the same provisions for the orderly development of land-use as now protects our urban areas. The reason for choosing this form of regulation is twofold. First, billboards could be permitted in certain areas and prohibited in all others. Second, we are dealing with a comprehensive problem of which billboards are only a part.

The growth of "ribbon slums" referred to previously cause serious depreciation of adjacent property values. A mere billboard regulation would not prevent the junkyards, shacks, hot-dog stands, and the like, from springing up. It would not prevent the spreading out of business establishments all along the road. These developments can cause loss of tourist trade, increase accidents, and decrease the traffic-carrying capacity of the road. If structures are permitted right up against the highway, parking, and cutting in and out on the highway becomes a traffic hazard. There is also the problem of the future widening of the road because of increased use of the road, or military necessity.

The zoning law would be administered by a zoning commission set up in the highway department. When a road is selected for zoning, the highway forms the center line for a 1000 foot wide strip the

[29] In St. Louis Poster Advertising Co. v St. Louis, 249 U. S. 269, 39 S. C. 274, 63 L. E. 599 (1919), Holmes said, "If the city desires to discharge billboards by a high tax, we know of nothing to hinder, even apart from the right to prohibit them altogether."

entire length of the highway. This strip is divided into various zones or districts, such as business, industrial, agricultural, residential, and the like. In some cases the business zones are of two types.

The first is known as the highway service zone. This would include only those businesses which serve the travelling public, such as gasoline stations, lunch rooms, and information services. The second is the general highway business zone, which also serves the surrounding community. With the exception of residences and farm buildings, no structure may be built without a permit, and a set-back rule keeps the area immediately adjacent to the highway clear. *No billboards are permitted* in any of the zones except the general business and industrial zones. However, the land-owner may advertise on his own land business conducted on that property, such as roadside service, home occupation or the sale of products manufactured or grown by the owner.

All signs on business establishments are limited in size, and two-thirds of each sign must advertise the business conducted on the premises rather than the product. All these provisions may be varied to suit the individual needs of the particular jurisdiction or locality.[20] But it can be seen from the foregoing description of how zoning is applied to the development of the land surrounding the highway that it best meets the problem of billboard control.

Zoning may be on a state-wide basis or it may be accomplished by having each township or county zone its particular section. California has recently been quite successful in protecting some of its more scenic highways through the use of county strip-zoning. Over one-fourth of the counties in California now provide for some form of highway zoning protection. Excellent use has been made of what is known as the interim ordinance, in the case of new roads.

This ordinance keeps the status quo until a regular zoning law can be prepared. In cases where billboards and other non-conforming uses are already upon the highways, the law provides for their

[20] Three model acts are available to legislatures:

1. American Society of Planning Officials.
2. American Planning and Civic Association.
3. American Automobile Association.

House Bill 412, now before General Assembly of the Commonwealth of Pennsylvania, is a combination of these model acts.

removal after an amortization period. Although local zoning has been successful in some areas, it has generally failed to provide complete protection. It is often beneficial to those who control local politics that the highway not be zoned. The only way that a complete and uniform system of zoning can be obtained is on a state-wide basis. Since it is a state-wide problem, this would appear to be the more practicable solution.

Safeguarding Highway Revenues

ARTHUR C. BUTLER

Mr. Butler is Director of the National Highway Users Conference. He has been active in the highway transportation industry since 1930 and is the author of numerous articles on various phases of motor transportation. He left the newspaper field to join the staff of the National Automobile Chamber of Commerce in New York. Two years later, in 1932, he was appointed manager of the Motor Truck Division of the Automobile Manufacturers Association. This post he held until the war, when he was assigned to head the Military Vehicle Division of the Automotive Council for War Production. He worked with the armed services, the war agencies and highway-user groups on military-vehicle and commercial production. At the close of the war, Mr. Butler came to the Highway Users Conference at the request of Alfred P. Sloan, Jr., Chairman.

HOW ARE we going to secure needed improvements in our highway transportation system? How can the accident toll on our highways be reduced? How can congestion in our cities be alleviated? How can our rural highways be improved to desired standards of economical operation and convenience of use?

These are difficult questions to answer, but one fact is sure. A major road block to any solution of these problems is the *diversion of highway funds.*

Diversion is the use (or misuse) of special motor vehicle taxes for non-highway purposes. Diversion occurs when taxes paid by highway users for road purposes are used for something else. Most people, when they pay gasoline and registration taxes, believe this money will be used for highway purposes. Yet in 1946, more than $94,579,000 of highway user taxes were used otherwise. In that year, about 48 percent of Rhode Island's motor taxes were diverted. Florida diverted more than one-third of its highway-user taxes. Louisiana diverted one-fourth of its highway user taxes and four other states (Texas, Georgia, Nebraska and Tennessee) diverted over 15 per cent of their highway funds. From 1924 through 1946 the colossal sum of $2,317,471,000 of highway-user revenues was spent for

about everything but highways. This money would have built a lot of highways.

Consequences of Diversion

When funds provided for highways are diverted to other purposes, we find a serious impairment in an important phase of the nation's economy. Highway construction and maintenance funds are lost. We miss out on highways we have hoped and paid for. Deterioration steps in fast when roads are not improved or properly maintained. Urban congestion grows worse. Farm-to-market roads suffer because the funds for rural improvements have been dissipated. Sound economic long-range highway planning is thwarted. Costs of transportation of farm and manufactured products over the highways remain higher than necessary. Diversion of highway funds harms everyone who uses the highways or depends on the highways in any way.

Diversion an Unfair Tax Measure

Use of highway taxes for non-highway purposes constitutes a measure of taxation that is applied without reference to the taxpayer's interest, benefits or ability to pay.

Motor fuel taxes are paid by the vehicle owner in proportion to his use of the highway. The extent of this use comes as close as anything to a fair and practical measure of the tax or "toll" he should be required to contribute to the construction and maintenance bill. On the other hand, it is not a fair yardstick by which to measure a citizen's contribution to general government. When motor fuel taxes are used for general revenue, the farmer living ten miles from town contributes ten times as much to the general cost of government as a farmer who lives only one mile from town. This, of course, is in no relationship to the earning power, wealth or income of either.

The same inequality applies to the traveling salesman, the country doctor and the many others who eke out their daily livelihood only because the motor vehicle is part and parcel of their trade, business, or profession.

In addition to special highway user taxes for highway purposes, the motor vehicle owner makes his contribution to the cost of gener-

al government. He pays state sales taxes, personal property taxes, real estate taxes on his garage. And if in business, he pays the same taxes that apply to every other business. At present, he also pays emergency Federal automotive taxes, that go into the Treasury's general funds.

Improper use of highway funds subjects the motor vehicle owner to double barreled taxation for general revenue first as a citizen and second as a motor vehicle owner. A disproportionate share of the cost of government is thus imposed upon him.

How We Got Our Present Highway System

Before examining in detail the disservices of diversion, it might be appropriate to inquire how our present highway system has been made possible. Despite its many defects and needs for improvement, America can be proud of its system of highways and streets. It is the largest in the world. It has one mile of highway for every square mile of area. No other nation has highways that can compare. This system has been brought to its present high condition in a relatively short time. Virtually in less than thirty years.

Special motor vehicle taxes begin with the registration fee just after the turn of the century, although many of the early state registration laws were not designed as revenue producers. Motor vehicle registration was first adopted in New York in 1901. Connecticut, Massachusetts, Minnesota, Missouri, New Jersey, and Pennsylvania enacted this type of legislation in 1903. Other states followed this trend, and by 1914 all states, including the District of Columbia, had adopted license or registration laws.

As more and more states turned to registration or license laws, lawmakers became aware of the possibilities of this legislation producing revenue for the state. The monetary angle became pronounced after 1909 and was projected largely on the basis of the cost of administering the license law and the policing of motor vehicles.

In the beginning, most registration fees were levied on a flat rate per vehicle, but the raising of money soon became responsible for graduated license fees. By 1917, Minnesota was the only state not

having annual registrations. Now there are several bases for passenger car license fees, and many others for the registration of trucks, buses, and trailers.

The gasoline tax first made its appearance in Oregon in 1919 where it was levied for road purposes only. Prior to 1929, registration fees provided the greatest revenue. Imposition of state gasoline taxes spread with the same rapidity that characterized universal use of the registration fee. Within the same year that Oregon invented the gasoline tax, Colorado, New Mexico, and North Dakota had adopted this type of special motor vehicle tax. Only the three following years were required for fifteen states to pass gasoline tax laws, and within a ten-year period, every state in the Union, and the District of Columbia, had turned to this method of raising highway revenue.

The Initial revenue statutes generally contained dedicatory language specifically earmarking these funds for expenditure in construction, improvement and maintenance of highways. An analysis of these statutes clearly indicates that it was the legislative intention in the majority of cases to dedicate the full amount of these special taxes to the construction and maintenance of an adequate highway system and to the further purpose of meeting the progressive demands of the public for more roads.

Other types of tax levies on motor vehicles have since made their appearance. But highway-user groups agree that special automotive taxes should be confined to the registration fee and the gasoline tax. These taxes have been justified as special service levies for road construction, maintenance, and administration. The registration fee is generally regarded as a "first structure tax" and is considered a "readiness to serve" charge. It has been referred to as a fee for having the highway facilities available. The "second structure tax" or the gasoline levy depends upon highway use, and the user pays as he rides.

Federal Automotive Excises Not Highway Use Taxes

The Federal gasoline tax now levied at the rate of 1-½ cents a gallon, was first imposed in 1932 and was never intended, nor is it regarded

as a "highway user tax." It was originally levied and has been continued as an emergency tax for general purposes of government. Highway users, regarding this as unfair and discriminatory, have urged retirement of the Federal Government from the field of gasoline taxes. This field of taxation, they believe, should be reserved by the states and should not be invaded by the Federal Government. Although willing to pay their fair share of taxes for defense and general operation of the Federal Government, they do not feel they should be singled out as a class for special taxation for general purposes on the basis of their use of the highways.

Likewise the Federal excise taxes on motor vehicles, parts and accessories, tires, and tubes have never been regarded as "highway user taxes" and highway users feel that these levies are discriminatory and should be repealed now that the defense emergency is ended.

WHY DIVERSION IS WRONG AND UNSOUND

Diversion prevents development of good roads. Every dollar diverted to non-highway purposes means a dollar diverted from the construction and maintenance of roads. When such a policy is carried to the extreme it can not help but have an injurious effect on the future development of a state's highway system. The importance of good roads to the agricultural, industrial and recreational development of any state is beyond question.

Improved highways have removed the isolation of the farm. They have made possible in many areas development of a higher and more prosperous type of agriculture than was possible before highways were improved. Studies have shown that improved roads increase the value of farm properties over 20 per cent. Studies by the Iowa State College have shown that travel costs over improved rural roads have been decreased to three cents a vehicle mile as compared with eight cents when the roads were unimproved. The dependence of agriculture on highway transportation is more than evident when it is realized that more than 16 per cent of all passenger cars and 31 per cent of all trucks are located on farms.

Industry is becoming more and more dependent on highway transportation and good roads. Trucks are serving as connecting links in the assembly line of industrial production all over the nation. If all trucks were to stop running, the nation could not go on.

Diversion and Highway Accidents

According to the National Safety Council, state reports of fatal highway accidents indicated a road defect in 9 per cent of the accidents. These reported defects are usually specific flaws in the roadway itself. The percentage of such accident reports has been increasing in recent years. The Council makes the statement, "It is certain that many highways are not yet as safe as they could be made." Records compiled by the state highway planning surveys support this statement and no doubt many hazardous spots on state highways could have been removed with highway taxes that have been used for non-highway purposes.

Diversion of funds collected from highway users has certainly curtailed the support of state highway patrols, state highway safety educational programs, and the installation of warranted traffic engineering devices. Thus diversion limits proved their soundness as methods of protecting life and property on state highways.

Diversion Frustrates Long-Range Planning

In states where diversion is practiced, highway departments have no way of estimating how much revenue they will have except from legislative session to legislative session. Consequently, the planning of such state departments has to be on a year-to-year, or biennium-to-biennium basis.

This means that highways cannot be built as efficiently as in those states where financial planning can be projected at least ten years into the future. Such financial projections can be made with a fair degree of accuracy only in states with constitutional amendments guaranteeing that motor vehicle license fees and motor vehicle taxes will be used for highway purposes.

Good roads are necessary for a state's recreational development. Competition for the tourist dollar is everywhere becoming keener. Those states that continue to improve their highway system will attract more tourists than states that neglect their highways through diversion of highway-user revenues. More than three-quarters of all tourists travel by automobile or bus. Thus, to more than three-quarters of them, adequate and safe highways are important.

A survey by the American Automobile Association prior to the war to determine the most important factors influencing tourists as to where they should spend their vacations, discovered that 35 per cent of the tourists visit a section because they have been there before and 20 per cent more visit a section because their friends recommend it. In other words, 55 per cent, or over half the tourist trade in a particular state depends on what visitors who have been in it think of that state. The impression these visitors take away with them will depend to a large extent on the quality of the highways they find. Obviously, if the highway funds of the state are continually diverted, visitors will find narrow, dangerous and poorly paved highways.

Diversion Encourages Higher Taxes

All too frequently, taxes have been levied on those sources offering the least resistance to the impost. This frailty has always been prevalent in times of stress. All too often, the idea has been followed that taxing a citizen is like plucking a goose—the object being to get a maximum of feathers with a minimum of squawk.

During times of financial stringency, many of the ordinary and usual streams of revenue are dried at their source; others are reduced to a mere trickle of their former flow. Governmental function, however, must continue and, in times such as these, with the addition of relief burdens, the actual necessity of governmental spending increases.

It is not surprising, therefore, that these motor taxes are so easily diverted to other purposes than those for which they originally were imposed.

The next step is imminent and almost certain in every instance.

With part of the tax diverted to other uses, more taxes must be raised to meet the original and continuing needs. The circle is complete. Diversion inspires higher taxes. Higher taxes inspire diversion.

The underlying tendency of the public is to avoid the full payment of any tax that is deemed unfair or burdensome. Lack of uniformity in taxes among the several states has led to much avoidance through the simple expediency of filling the gas tank in the adjoining low-tax state and thus avoiding payment of the higher tax at home. In states where abnormally high taxes or diversions prevail, records show motor fuel is frequently purchased in quantity on sworn statements that it is to be used for tax-exempt purposes, when the true intention is quite the contrary.

Diversion, the Worker, and Employment

Wage earners are more seriously penalized by the improper use of highway funds than other groups. Vehicle taxes fall heavily on the wage earners and since diversion means higher taxes, they suffer most.

The motor car and the motor bus are woven into the everyday living habits of a great number of working-class families. In literally hundreds of thousands of these families they are the only means of transportation by which the wage earner can get from his home to his job and back again. In such cases, the automobile and the bus occupy a place among the necessities of life and must be used in providing food, clothing and shelter.

The working-class family is more dependent on economical highway transportation than any other group and hence more vitally affected by excessive taxation which tends to increase transportation costs and the prices of commodities consumed.

In depression years, road building is of great importance in creating work. It provides a type of construction work in which a high percentage of the cost is expended for labor. As much as 91 per cent of the dollar expended for street and highway improvement is ultimately paid out as wages and salaries, it has been established by detailed studies by the Public Roads Administration. Diversion of

highway funds to other purposes, however worthy, thus unavoidably results in a loss of jobs.

CONGRESS CONDEMNS DIVERSION

The Federal Government registered its opposition toward improper use of motor vehicle funds for other than highway purposes as early as October 1932, in the Report of the Federal Oil Conservation Board to the President of the United States. This report, signed by the Secretary of the Interior, the Secretary of War, the Secretary of the Navy and the Secretary of Commerce, said:

> In many states, proceeds of gasoline taxes have been used for purposes having no relation to the use of automobiles on the highways. * * * Such uses of funds derived from gasoline taxes are at variance with the purpose of the tax at its inception. Therefore, the fourth essential feature of a successful uniform gasoline tax law is that no part of the revenue derived from the tax shall be diverted to uses other than for the benefit of automotive motor vehicles.[1]

The United States Congress repeatedly has declared its opposition to the principle of diversion. Its position is clearly stated in the Hayden-Cartwright Act of 1934 as follows:

> Since it is unfair and unjust to tax motor-vehicle transportation unless the proceeds of such taxation are applied to the construction, improvement, or maintenance of highways, after June 30, 1935, Federal aid for highway construction shall be extended only to those States that use at least the amounts now provided by law for such purposes in each State from State motor vehicle registration fees, licenses, gasoline taxes, and other special taxes on motor vehicle owners and operators * * *.[2]

[1] Excerpt from Report V of the Federal Oil Conservation Board to the President of the United States, October 1932.

[2] Section 12 of the Act of June 18, 1934 (48 Stat. 993 at 995). The balance of the section reads: "* * * of all kinds for the construction, improvement and maintenance of highways and administrative expenses in connection therewith, including the retirement of bonds for the

This Congressional policy was reaffirmed in the Federal Aid Highway Act of 1944. Section 6 of this Act permits advance of Federal Funds to States to expedite completion of projects "*Provided,* That such State, after June 30, 1945, does not divert to other than highway uses road user revenues in violation of Section 12 of the Highway Act of June 18,1934."[2]

Diversion Nullifies Federal-Aid

Diversion nullifies the fundamental principles of the Federal-aid system, which was first established in 1916 to assist the states in building a uniform system of highways. The theory behind Federal-aid is to help states, particularly those with large area and limited financial resources, to build roads which are of strategic value and serve the public good.

In many states, however, there would be more funds available for highway building without Federal-aid if all the revenues collected from the highway users were applied to road purposes. The year 1941, the last year before the war, illustrates this situation. In this year the total amount of highway user funds diverted by the states as a whole exceeded $215,000,000, which was 35.6 per cent more than Federal highway aid grants in that year. New York State, for example, diverted $64,385,000 of its highway user revenues to non-road purposes in 1941, and in that same year the state received $8,152,000 in Federal highway aid. In other words, New York State diverted eight times as much of its own highway revenues as it obtained in

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payment of which such revenues have been pledged, and for no other purposes, under such regulations as the Secretary of Agriculture shall promulgate from time to time: Provided, That in no case shall the provisions of this section operate to deprive any State of more than one-third of the amount to which that State would be entitled under any apportionment hereafter made, for the fiscal year for which the apportionment is made." Despite the opposition thus stated in principle, this language has not proved effective in barring all diversions.

See also Section 1 (d) of the Act of June 16, 1936 (40 Stat. 1519; Public Law No. 686, 74th Congress) relieving States from matching under certain conditions if special taxes on motor vehicle transportation have not been diverted; and Section 11 of the Federal Aid Highway Act of 1938 (Act of June 8, 1938; 52 Stat. 663) authorizing reapportionment of funds withheld from any State as a penalty for diversion of road-user taxes.

[2] Act of December 20, 1944; Public Law 521, 78th Congress.

Federal highway grants. Nine other states[4] in 1941 allocated much more of their own automotive tax funds to non-road purposes than they received in Federal highway aid.

Despite present road needs, this paradoxical situation continues. According to the latest available figures (1946) nine states and the District of Columbia divert more money than they receive in Federal funds.[5] These states in effect used Federal-aid to substitute in part for tax funds which have gone in other directions. It means that the highway users are not receiving the road benefits from Federal-aid to which they are entitled.

Why Earmark Highway Funds?

Some persons argue that it is improper to segregate state funds, that all state funds should be lumped together in the general fund for expenditure as the state legislature may desire. Why, they argue, if highway taxes are earmarked for highway purposes, shouldn't liquor taxes be earmarked for the rehabilitation of alcoholics or cigarette taxes be used only for consumers of tobacco? The answer, of course, is that cigarette and liquor taxes are luxury taxes, whereas motorists' special taxes are use taxes. For example, the State of New Hampshire

[4] Delaware, Florida, Georgia, Louisiana, Oklahoma, Rhode Island, Tennessee, Texas, and Wisconsin.

[5]	*Federal funds Received 1946*	*Diversions 1946*	*% Diversions of Federal Fund*
Florida	$ 1,417,000	$ 17,998,000	1270.1%
Georgia	4,449,000	5,820,000	130.8
Louisiana	2,518,000	7,245,000	287.7
Maryland	606,000	1,620,000	267.3
Ohio	2,321,000	9,169,000	395.0
Rhode Island	86,000	3,371,000	3919.8
Tennessee	4,732,000	6,229,000	131.6
Texas	11,698,000	19,442,000	166.2
Wisconsin	2,010,000	3,827,000	190.4
Dist. of Columbia	158,000	450,000	284.8
Total	$ 29,995,000	$ 65,171,000	217.2

defines the gasoline tax in its statutes as a toll. Taxes in general can be classified under three divisions:

1. *General Taxes.* Under this classification come such taxes as income, real estate and sales taxes which are levied on the entire citizenry for the general purposes of government.

2. *Luxury Taxes.* These include taxes on cigaretttes, liquor, amusements, playing cards, jewelry, furs, and the like.

3. *Use or Benefit Taxes.* These include fees paid to the government for special services which it renders to those who pay the fees, for example, social security taxes and the postage fees. Under this classification come gasoline taxes and the motorists' license fees.

Such taxes are imposed under a continuing compact that they will be used for the purpose for which they are collected. They are thus similar to unemployment compensation taxes which are earmarked for the special purpose for which collected (i.e. the payment of unemployment benefits to the insured).

As benefit taxes, they are clearly different from the tax contributions paid for general governmental expenses. The highway user pays his share of these general governmental expenses in the same way as every other citizen, through payments of income, sales, property, and other taxes.

As a matter of fact, he pays a higher percentage of some of these general taxes because of his ownership and operation of a motor vehicle. Through these taxes the highway user pays his fair contribution to general governmental expenses. It is only fair that the additional special motor vehicle taxes should be earmarked for the purpose for which paid.

The "One Fund" Maze

The practical objection to non-segregation of highway revenues is shown in the "one fund" states. In five states, Delaware, Georgia, New Jersey, New York, and Rhode Island, highway user revenues are not segregated but are placed in the state general fund where they are available for highway and any other purposes that may be

decided upon. This procedure of commingling funds makes it almost impossible to trace the disposition of highway revenues.

In statistical reports, such as those prepared by the Public Roads Administration, in these one fund states, expenditures for all highway purposes by the state are credited against net collections from highway user taxes. Only in the case that such net highway user taxes exceed highway expenditures is it possible to clearly state that there is a diversion.

The effect of this type of accounting is to charge highway users with 100 per cent of highway costs. This result is contrary to the findings of the Eastman Report which determine that for the period in question, motor vehicle users should be charged 83 per cent of the cost of state highways, 34 per cent of the cost of county and local roads and 30 per cent for city streets.

Perhaps the most telling indictment of this practice is shown in the records of these one fund states in the management of their highway user revenues.

	Total Highway User Revenues 1942–1946	*Diversion 1942–1946*	*Per Cent Diversion*	*Total Diversion 1942–1946*
Delaware	$ 15,981,000	$ 2,116,000	13.2	$ 4,748,000
Georgia	130,424,000	20,484,000	15.7	73,250,000
New Jersey	202,775,000	41,450,000	20.4	143,995,000
New York	511,971,000	132,450,000	25.9	710,196,000
Rhode Island	31,423,000	15,508,000	49.4	38,807,000

In all of these states there are critical highway deficiencies, yet these states have been among the worst offenders in the practice of diversion.

It would appear that segregation of highway revenues would supply a helpful influence in eliminating the existing hand-to-mouth financing practices.

The Only Sure Protection

Sad experience has shown that the only effective way to protect the integrity of highway funds is by adoption of an amendment to the state constitution. Promises of legislators have failed. Statutory dedication of highway taxes to highway purposes has been ineffective.

Only through the adoption of a constitutional amendment in the state constitution is there an effective safeguard against improper use of highway funds. Twenty states have amendments of various kinds. These states are: California, Colorado, Idaho, Iowa, Kansas, Kentucky, Maine, Michigan, Minnesota, Missouri, Nevada, New Hampshire, North Dakota, Ohio, Oregon, Pennsylvania, South Dakota, Texas, Washington and West Virginia.

In addition, 1947 state legislatures in Massachusetts and Tennessee approved anti-diversion constitutional amendments for submission to the people at the next general elections. In numerous other states serious efforts are being continued to secure constitutional protection of highway funds. Legislation to submit such proposals to a vote of the people can be expected to make its appearance in many future sessions of state legislatures.

Constitutional Safeguards Only Answer to Diversion

Some opponents of protection of highways funds, by constitutional amendment, advance the argument that dedication of highway taxes to highway purposes can be accomplished by action of state legislatures. This argument overlooks the fact that the action of no particular legislature is binding upon any succeeding legislatures and that statutory protection of highway funds can be annulled even by the same session which enacted it. A constitutional amendment dedicating highway funds to highway purposes, on the other hand, sets policy of the state regarding the use of highway user revenues in such a definite way that it has a binding effect on future legislatures.

People sometimes ask the question "Why tinker with the Constitution?" That question has been asked and answered from the founding of the American Republic. The "Bill of Rights" was adopted as an amendment to the Federal Constitution only a short time after that document was ratified by the states. The constitutions of the states have been amended frequently to keep abreast with changing times.

Fundamental questions of state policy, such as this is, belong in the Constitution. The Constitution was devised as a means of outlining basic policies, of limiting and defining the powers of the

legislature, and of establishing the rights of the people. Since these are the purposes of an amendment to safeguard road funds, such a statement of policy rightfully belongs in the Constitution rather than in the statute books.

When the constitutions of the states were formulated, the diversion of special-purpose taxes was virtually unknown, and for that reason, few of our state constitutions contained provisions relating specifically to that problem. Constitutions are built upon past experience, and it is because of that fact that constitutions must be amended to meet changing conditions.

The rights of the people are set forth in constitutions so that the legislature shall not trespass upon them. The powers of taxation and appropriation of the legislature are defined and limited to protect the rights of the people. Constitutions set forth the rules of legislatures, and legislatures are free to divert automotive tax funds if the people have not set up a constitutional provision against such practice.

Statutes, on the other hand, concern themselves with relations between the citizens of the state. Statutes are chiefly rules of human conduct, rules set up by the legislature to preserve and protect the principles set forth in the Constitution. Statutes aim to protect individual rights from infringement by individuals.

The raiding of highway funds is a radical departure from the traditional American principles of fair and above-board taxation. The problem is definitely one of constitutional stature—one which should be answered by the sovereign, the people.

If we analyze the reasoning of these persons who oppose a good roads amendment on the ground that it would tie the hands of the legislature in times of emergency, we must conclude that they are diversionists at heart. If we look at the record of diversions in the various states, we find that all such practices started because the legislature was pressed for funds to balance the budget.

A good roads constitutional amendment certainly seeks as its primary purpose to curtail the unlimited powers of appropriation of the legislature when times are hard and emergency conditions of financing arise.

Many state constitutions circumscribe the taxing powers of the

legislature. The people have felt that it was unwise to leave to the wisdom of the legislature the power to define the limits of fair and just taxation. Likewise, there are other provisions in state constitutions that limit the powers of appropriation of the legislature. Such provisions are not suspended in times of "emergency." There is not one code for good times and another for hard times.

Other persons argue that limitations on the powers of appropriation of highway funds should not be incorporated in the Constitution. Most of these persons would not approve of permitting the legislature a free hand in sinking funds. But they argue that no constitutional strings should be placed on road funds. There may be emergencies, they say, when the legislature will need to seize upon monies when and where they can be found.

If we analyze that argument, it will not hold water. A constitutional amendment aims at preventing raids upon the road funds in hard times; it aims to preserve the integrity of such funds and to preserve our traditional principles of fair taxation when emergencies create deficits in the public treasury.

Let the People Decide

In order to avoid misunderstanding of the purposes of an anti-diversion constitutional amendment and the variety of frivolous objections which have been advanced in the past, the text of the proposed amendment should be precise, concise, clear and limited to the single subject of stopping diversion.

Because of the complexity of issues at the polls it is seldom that the people secure an opportunity to make a clean cut expression of their desires. It would, therefore, appear that there could be little objection to affording the voters an opportunity to express their mandate on the important issue of integrity of highway funds. Certainly, it would be directly in accordance with democratic principles.

Speed-Tests Are Emphasized in Kansas City

H. W. JOHNSON

Chief Johnson, who is a guest lecturer on traffic regulation, from time to time, at the National Academy of the Federal Bureau of Investigation at Washington, has risen through the ranks of the Kansas City, Missouri, Police Department. He has been Chief of Police since February 18, 1947. This promotion came 24 years after he was appointed a class C patrolman in Kansas City and assigned to the traffic squad. He became a police sergeant in 1930, a police lieutenant in 1936, and an Inspector nine months later. He was promoted to Superintendent of the Safety Division in 1939. In 1942, he was granted a leave of absence to serve with the armed forces. He returned to police duty in 1946. Chief Johnson has a national reputation for outstanding work in the educational and public relations activities of traffic accident prevention.

Like the average American city fifty years old, or older, Kansas City, Missouri, faces the many problems of motor traffic on streets laid out before the days of motor vehicles.

Some thirty years ago we found that the regulation of traffic and the enforcement of traffic ordinances had become a major responsibility of the police department. Before that time, these duties had been more or less a police *sideline*. We had no separate unit specializing in traffic control.

About 1921, we began seriously to recognize that motor vehicles would use our streets in increasing numbers year after year, and that a new menace to human life was developing. So we formed a traffic division within our department, and began the traffic-safety program that has become nationally known because of never-ceasing and progressive measures to make our streets more safe.

In those earlier days, a few officers on downtown intersections used arms and whistles to direct vehicles. Then we placed a standard-mounted semaphore in the center of the intersection. An officer turned the semaphore, held up a hand, whistled, clearing one move-

ment to make way for another. Later came electrically operated signals. More and more were installed year by year, until now our important points of hazard and congestion are fairly well protected.

Signalized intersections handle tens of thousands of vehicles with reasonable dispatch. They save police manpower. But they fail to control the human element that involves light-jumping, tardy entering of intersections, and prohibited turns. I suppose the only way to control the mistakes of human beings, unintentional or deliberate, would be to post one or more policemen at every intersection in a community. And that of course is out of reason.

Kansas City has 750 miles of streets, and 6,500 intersections. Of the 750 miles, 164 miles are traffic arteries. We also have 122 miles of boulevards and park drives. The boulevard mileage is not entirely separate from the artery mileage since some of our boulevards are classed as arteries, and would be found in both figures.

Two hundred thousand cars move in and out of Kansas City's downtown district every twenty-four hours. In the same period, 180 passenger trains, 660 freight trains, and 508 buses enter and leave our community. Again during the same period, more than 105,000 vehicles enter over seven federal highways.

Across the state line is Kansas City, Kansas, with a population of more than 150,000. In Johnson County, Kansas, just south of Kansas City, Kansas, and contiguous with the southwestern limits of Kansas City, Missouri, are several residential areas where thousands more live. To the north of us, across the Missouri river, is North Kansas City, a thriving industrial center fringed with residential areas. To the east is a solidly-built inter-city district that merges with Independence, Missouri. Independence itself has a population of 25,000.

I call attention to this metropolitan area because Kansas City in 1940 was given a population of slightly over 399,000 by the federal census, and the suburban areas were much less thickly populated. It is safe to say that our metropolitan area today is close to 850,000, with Kansas City, Missouri, proper in the neighborhood of 450,000.

The lighting system here is being transformed to an ultra-modern type of illumination. We still have several hundred miles of streets which are either gas or electric bulb lighted—this was all right in the

day of wagons and carriages, but it is inadequate in this era of fast-moving motor traffic. As rapidly as possible, therefore, we are installing controlled light. This makes objects visible and definitely is lowering our accident rate. Twenty-two miles of this new lighting have been in operation throughout 1947. Consequently we can make comparisons with 1945:

	1945	1947
Property damage accidents	.55 to 1	.52 to 1
Injury accidents	1.07 to 1	.65 to 1
Fatal accidents	9.00 to 1	1.33 to 1

The 1, of course, refers to daytime accidents. The drop in property-damage accidents under the new lighting system is not great, but there is a pronounced reduction in fatalities, and a satisfactory start towards lowering injury-accidents. The new lighting has been extended until it now covers sixty miles of our thoroughfares; installation is being continued as rapidly as equipment is obtainable. We expect to have another forty miles of arteries relighted this year. Eventually, all of Kansas City will be given the additional night-time safeguard of this modern type of lighting.

The City Traffic Engineer of Kansas City, Tom Seburn, works in close harmony with the police department. As rapidly as accidents, violations, and indications of confusion or uncertainty by drivers are discovered in our enforcement work, we consult with Mr. Seburn in an effort to correct physical hazards. This is accomplished through the painting of pavements, the installing of Slow or Stop signs, various Warning signs, and expansion of the signalized control of intersections.

In our own enforcement program, under the direction of Captain E. K. Burgard, we have developed what I believe is high efficiency in our selective enforcement activities. Years ago when I was made Superintendent of the Traffic-Safety Division, it seemed to me that traffic regulation and enforcement could not be successful on a hit-and-miss basis. We obtained heavy iron standards on which we mounted maps of the city, each in a metal frame on swivels, rotating on the main shaft.

Each map represented a phase of the traffic-accident situation. One represented property-damage accidents; another represented injury, and still another, fatalities. Other maps recorded types of common violations. Colored pins designated the time of occurrence of these accidents and violations. The maps were posted daily. This gave us a clear picture of what was happening and enabled us to cover the danger points with additional personnel. We found long ago that any arbitrary assignment of a given number of men to traffic duty will not get the job done. Any traffic force must be sufficiently flexible to spread it around to meet conditions that develop.

Excessive speed by motor vehicles is the number one problem of the average community. Unfortunately, no police department has enough manpower to watch the traffic of all thoroughfares. In Kansas City, we have a twenty-five-mile speed limit on residence streets; a limit of twenty miles an hour through intersections. On the traffic arteries the limit is thirty-five miles an hour in the daytime; at night all traffic is limited to twenty-five miles an hour. We post Stop-signs at all school intersections. These signs warn the driver to proceed—*after his stop*—at not more than fifteen miles an hour, until he has cleared the school area.

Needless to say all of these limitations are violated. More important than any of these speed rules is the basic speed law of our traffic code. This requires that a driver proceed at a speed slow enough at any point in the city, regardless of permitted speeds, to safeguard others against accidents. As an example, a vehicle traveling on a thirty-five mile artery and approaching a business section where there is heavy pedestrian and vehicular traffic must reduce its speed as much as necessary for safety. This might be as little as ten miles an hour. Violators of this basic law must be prosecuted for careless driving because they cannot be charged with speeding.

We use three different methods in the apprehension of speed violators. One is the pacing of a vehicle for a distance of not less than two blocks. It is imperative that all officers excercise the same amount of tolerance so that the public can expect the same kind of treatment regardless of which officer handles the case. We use a tolerance of six miles on 25 mile streets, and five miles on 35 mile streets. This tends

to remove human errors that might be present in arrests. This information is not made public, of course, or many drivers would drive the limit within the tolerance. Apprehension by pacing is enforced by the entire enforcement personnel assigned to patrol cars.

From June 1 to June 28 our Municipal Courts had before them 1400 speeding cases; 87 cases were dismissed by the courts because defendants had left town and could not be located. Of the 1400 cases, approximately 250 had been paced and the others had been checked through speed checks. Our courts make no distinction in the cases. We have about 99 per cent convictions in all of our speeding cases.

Another method is through use of the Automatic Speed Check, designed and perfected by Roy DeShaffon, Sr., Supervisor of Communications of our department. It operates on a system of changing air pressure. The motor car being checked does all the work with split-second accuracy. Long lines of thin rubber hose are strung across the street at measured intervals. These hose lines are connected to a small aluminum container that houses a rubber diaphragm and contact points. As the car passes over the rubber hose, the air pressure in the hose is abruptly changed. This change forces the diaphragm up and makes the contact points meet. These points complete an electrical circuit which trips a switch in the control cabinet of the speed checker and starts a stop watch.

The process that trips the switch—the electrical impulse—locks a relay in the cabinet that prevents further action over the first hose from other motor cars. The process is followed again as the car passes over the second line of hose, except that it trips another switch that stops the watch. By computing the time it took the motor car to travel the measured distance, the speed of the car can be determined. Members of the department, trained in using the checker, permit any motorist stopped to watch the small machine in operation or to manipulate the controls. The motorist usually is convinced he was wrong and a plea of guilty follows his appearance in court.

Our speed checks have proved to the public that this is the most accurate way to obtain the actual speed a motorist is traveling. We have given public demonstrations, the press has printed many articles relative to the effectiveness of this check, and our radio stations

have announced from time to time on the air the working procedure of the automatic speed check and the use of the stop watch. In making the checks, a 112 foot course is marked off and it is through this course that cars are checked. (The actual distance for a check is 110 feet, but the additional 2 feet is added for the human error). In talking to the public, I have met only two persons, both offenders, who felt the speed checks were unfair. They could give no reason why they felt this way other than the fact that they had been arrested.

With this device we use telephone sets—one at the machine, another a block or two away. When the operator of the vehicle is observed speeding and is checked through the speed check, the officer talks by telephone to another officer at the end of the line and gives him the information such as type of vehicle, license number, and time it took the vehicle to travel through the 110-foot speed check, thus computing the speed of the violator.

The receiving officer steps to the center of the street, flags down the motorist and issues a summons to Municipal Court. This method eliminates the use of vehicles to apprehend speeders. It saves wear and tear on police equipment and eliminates the possibility of accidents while chasing speeders.

The third method uses stop watches at intersections where white lines are painted on the pavement 110 feet apart. This method is used on arterial streets, on intersections with a poor range of vision, and on intersections where accidents occur more frequently. Approximately 700 intersections are painted with these lines. We find they cause motorists to reduce speed wherever they see the lines. Officers use the telephone-check when working this type. Checks can be operated, however, by one man on a solo motorcycle.

Our department is working out a new automatic device to be operated by photo-electric cells. Its completion has been delayed by our inability to get necessary material. When the device is completed, it will eliminate rubber hose across the pavement. Our present checking cannot be used on streets with car rails.

We have thirty-one men assigned to the motorcycle unit. All of them ride solo motorcycles. In rainy or icy weather, when the solo cannot be safely used, our motorcycle men use motor cars—a serious

handicap in traffic enforcement on bad days. We also have fourteen men assigned to three-wheelers, attached to the downtown traffic unit. Most of our solo motorcycles have radio receivers; the three-wheelers have two-way radios. We find the three-wheelers much more practical in traffic work. They operate in all kinds of weather, and are less often involved in accidents.

We are gradually converting most of our traffic equipment to three-wheelers. We shall always need a few solos. They can perform work not practical for three-wheelers or motor cars. From the weather bureau, we get monthly reports on complete information of weather conditions. A study of them is something of a surprise. Many more days are too wet or cold for solos than one might imagine. From the standpoint of getting the most out of the investment, three-wheelers definitely have proved their worth.

The parking problem is of concern to most metropolitan police departments. Limited curb space, inadequate off-street parking lots and garages, and the increasingly heavy demand for parking in all business sections make it necessary to keep a close eye on over-time parking. This is true not only in the main business section but also in those outlying business sections that dot the residential areas of a large city.

In our curb-parking problem, three-wheelers again prove their worth. They check parked cars and chalk-mark tires so overtime parkers can be issued tickets where there are no meters. We have found three-wheelers practical also in escorting tow-trucks. The three-wheelers stand by while the tow-truck hooks on to the illegally parked car; then proceeds ahead of the truck to the parking lot where cars are impounded.

Three-wheelers perform many other police duties at less expense and with more dispatch than can motor cars. Of course they cannot be used in chasing speeders. The only equipment satisfactory for this is the solo, though it is hazardous to both rider and machine. We hope we are getting away from chasing speeders, particularly traffic violators. It will always be necessary to chase thieves and other criminals who try to escape. But we want to make the apprehension of traffic speeders a modern, up-to-date system of speed checks. So acceptable

in Municipal Court is the testimony of our officers handling these checks that we do not lose our cases. That, after all, is the test of law enforcement.

Before the scientific speed checks were introduced by our Department, many of our speeding cases were lost because we did not have the backing of the courts. Records show that since 1940, some 95 per cent of persons arrested on charges of speeding received fines. Last year, 16,677 persons were arrested on charges of speeding; 864 were dismissed by the courts, the reasons being they had moved from the city, or had died, or had been charged with more serious offenses and held for trial in state courts.

These speed checks are in no sense *traps*. They are conducted in the open, and are recognized as open enforcement by our courts. This again is sufficient evidence of soundness.

Our school officers represent another unit of the Traffic-Safety Division. Some of them are regular members of the department—older men who after giving most of their lives to police service, are on pension or about to be pensioned. Others are men pensioned from industrial jobs. They serve on school crossings during the morning, noon and afternoon hours when children go to and from school. During school vacations, many are assigned to parks and playgrounds where supervised recreation is carried on under the direction of the City Welfare Department.

These men have so endeared themselves to school children that when one of them is forced to quit work, pupils, teachers and parents try in every way to keep him on the job. If that is not practicable, they shower him with gifts at a farewell party. We have checked all school crossings and manned the majority of them. We have demands for other crossings, but are limited by both personnel and budget.

This picture sketches what Kansas City is doing to give Kansas City, with its marked growth since 1940, the high standing in traffic safety it had in 1940, when we were adjudged the safest city of our population class in America. That year we had only twenty-four fatalities. Of course today, more thousands of motor vehicles are driven on our streets than in 1940. Many new people have come here to live. And since Pearl Harbor was bombed, all Americans have been under

tension of one kind or another—tensions that have written their toll in traffic accidents. Traffic fatalities in Kansas City went to seventy-one two years ago, then dropped to forty-six last year.

War on traffic is a constant battle. We intend to keep on fighting and to use the best devices to prove in court exactly what violators have done. And side by side with progressive enforcement, we are conducting an intensive and continuous educational campaign.

The Effects of Traffic Trends on Transit Movement

THEODORE M. MATSON

Mr. Matson is Director of the Bureau of Highway Traffic at Yale University and a member of the Board of Consultants of the Eno Foundation. He participated in the early traffic studies for San Francisco, Los Angeles, Kansas City and New York. He was formerly traffic engineer for the city of Philadelphia. He is a member of the Institute of Traffic Engineers, of the Highway Research Board, of the American Society of Municipal Engineers, and of the American Public Works Association. The following article was read as a paper at the 67th annual convention of the American Transit Association at Atlantic City on September 28, 1948.

As one places the developments taking place in urban traffic into the perspective necessary to show trends, and relates these developments to the operation of transit systems, he is struck with several changes which seem significant to the transit operator. Perhaps the outstanding items which merit attention can be classified into three categories.

These are: (1) changes in vehicles of urban traffic; (2) regulations designed to improve street traffic movement; and (3) the plans and designs of new facilities for traffic improvement purposes. All of these are taking place against a background of urban development which seems to point toward further decentralization of our cities with its concomitant requirement for more mileage of route and vehicle miles of travel.

The greatest change in the vehicles of travel has been made by transit operators themselves. While the pros and contras of the free-wheel vehicle in comparison with the rail vehicle may be discussed at length, it is clear that from the viewpoint of street traffic as a whole, the pneumatic-tired vehicle possesses a greater flexibility not only in its adaptation to routes of travel but also in the detailed operation of a particular street at a particular point.

While three busses seem to be required to replace two trolleys,

thereby absorbing additional street space on those routes where bus operation has supplanted trolley methods, there usually results a greater traffic facility through overtaking and passing opportunity for both common carrier and private vehicles which does not exist under rail operation. Again, the flexibility of the free-wheel vehicle in detouring for temporary route repairs and reconstruction is apparent.

Still further, motor bus operation permits routing for special loads of a casual or periodic nature. Replacement of rail with free-wheel vehicles, therefore, on those routes where its practicability allows, has generally resulted in better traffic conditions for both the common carriers and the private vehicles and has, it is believed, incurred a fuller measure of goodwill toward the operating company.

Again, the trend toward better acceleration and deceleration ability in the newer types of rail vehicles has been in tune with the same abilities in the other vehicular units in the traffic stream, and has resulted in a more harmonious adjustment of transit vehicles to the tempo of traffic conditions on the great mileage of routes in urban areas.

"Where Can I Park?"

Turning attention now to the regulatory measures, perhaps the greatest traffic bug-a-boo of the transit operator is curb parking. Here is found a deterrent to smooth and certain transit flow, the cause of which stems not from transit operation itself but from transit's greatest competitor. But the barnacle influence of curb parking is felt by all other vehicles in the traffic stream as well as transit vehicles, and the trend seems to point inevitably towards more and more stringent regulation of curb parking.

Generally speaking, however, parking regulations can only eliminate double parking, and it is only on limited mileages of extreme traffic pressure that movement in the curb lane is found possible today. Even with the adoption of no parking, no standing, and no stopping regulation through acts of local legislatures or by police power, the police themselves, even with tow truck techniques, cannot ordinarily satisfactorily guarantee free path for movement next

to the curbs. The reason is obvious for in the first place, movement alone does not accomplish the ends of transportation and since little has been done to create off-street parking at needed locations, the police officer, when confronted on his beat with the question of "Where can I park?" cannot give a reasonable answer to the citizen who wants to be reasonable.

It is submitted, therefore, that transit operators will rid themselves of the parking curse most quickly by tacitly approving or even urging the creation of off-street parking and loading facilities. It must be remembered that in the competition for rendering transportation of persons, facility and dependability of service are fundamental. These cannot be secured, however, by placing the blame on competitive forms of movement, but rather by taking positive action looking toward the intelligent handling of parking in dense traffic areas. The common good of all users of the street, common carriers as well as private, who wish to use the street for movement rather than carrying on terminal operations will be found by ridding the streets of the terminal purposes they render in those areas and at those times such terminal operations interfere with movement. This can best be accomplished by providing off-street loading and parking facilities where actual terminal demands warrant mere regulation alone, and by itself does not satisfactorily provide for these terminal purposes. It is clear that the purposes of private vehicles as well as common carriers are mutual in regard to facility of movement.

Another important trend in traffic control and regulation is the signalization of intersections in such manner as to provide a time-space coordination which will permit continuous speeds in accordance with the time of day. There is no great mystery in signal coordination and its intelligent developments in accordance with the details of traffic demand for each route of travel can yield fruitful results in increasing the over-all speed of movement. Thus, with a choice of patterns of coordination available, and with a choice of cycle lengths suited to the street geometry and speed of movement, coordination of traffic can be maintained so as to serve continuous movement of vehicles travelling at base speed and the odd reciprocals of such speed as well. For example, a street set for 21 mph for express vehicles will also accommodate those which average only 7 mph

due to loading and unloading in an alternate pattern of coordination. Intelligent coordination of signals through use of proper signal equipment and its maintenance can do much to facilitate flow on many routes. Traffic engineers usually need and welcome support from the transit operator, not only in the technical details required but also in the administrative support of a well-balanced signal program.

The traffic capacity of our central business districts is frequently found wanting. In this regard, it is becoming increasingly evident that as a practical matter increased capacity can be secured only through the adoption of one-way traffic regulation. The inherent nature of one-way traffic flow is such that it engenders increased traffic capacity through elimination of traffic conflict at intersections. It permits use of odd lanes and does away with left-turn interference. Without developing all factors of advantages and disadvantages, it seems evident that the one-way plan of traffic regulation will be increasingly applied in diverse areas of American cities with their characteristic gridiron pattern. The increased facility and capacity of flow available from such control can be of invaluable assistance in reducing the traffic waste found in two-way operation. The transit operator who wants to take advantage of this relief from congestion can wisely plan for and support such regulation in many cities. In spite of the headaches which go with change, the rewards of such change will merit closest consideration.

Trends in Traffic Improvement

While time does not permit the development of other items of traffic regulation and control, the intelligent analysis of traffic characteristics and the application of uniform regulatory measures and traffic aids are vitally necessary for safe, convenient, and economic street use. The effectiveness of these measures depends on how well traffic engineering techniques consistent with economic, legislative, and enforcement limitation are applied. Parking, turning, signal, stop, one-way, and other similar regulations should not be arbitrarily applied. The development and application of these regulatory meas

ures are of deep concern in the details of transit operation and merit the full understanding and support of the transit operator as an important element in the traffic stream in each urban area.

Other trends in the improvement of street traffic conditions deal with the planning and design of new facilities. Through Federal legislation and grants-in-aid for highway improvements, state highway departments are charged with the job of developing major routes through urban areas. In conjunction with city administration, this work is going forward. Among its first phases of development are found intensive studies into the origin and destination of traffic movement. In many areas a 5-to-15 percent sample of the entire population is interviewed as to its transportation requirements or actual trips made by all modes of transportation on a typical day. On the basis of this sample, accurate determinations are made of the traffic movements in a given city and estimates are made of future demand. This type of traffic analysis is a basic requirement in the planning and design of major routes of travel. It is a commonly accepted procedure that yields a mine of information of greatest significance to the transit operator. From these data, he can determine very well the demands placed on his system, the percentage of total traffic demand he is getting, not only for the city as a whole but for each zone of the city. It forms a basis of planning transit route improvements and schedules and a foundation of inquiry as to which zones have undeveloped transit potentials. And, finally, it yields a rationale of planning major routes for the common purpose of serving transit and trucking as well as private vehicles. Such origin and destination studies are invaluable in planning future transit development in keeping with the demands of the area. It is my sincere belief that transit operators will do well to encourage such studies in their area of operation and to analyze the results of such studies from the viewpoint of the transit operator.

The development of non-stop traffic arteries which are being planned are considered by traffic engineers and others as essential in the healthy development and growth of urban areas. Development of major arteries of travel located and designed to accommodate modern vehicles and demands is certain to go forward with varying

degree of refinement and rapidity. The routes to be developed should be located and designed so as to serve the major movements of traffic.

Freedom of Choice Is Essential

It is clear that the transit loads in many areas are an important consideration in design and location of major routes. It is incumbent on the transit operator to sit in at the conference table where these planning and preliminary design matters are being decided so that he may contribute to this development by interpreting the transit needs in the community at hand. To fail in this job is to fail in reaching the best transit service for the community and hence to invite the loss of rewards which go with service. The development of express and local forms of transit traffic closely suited to the needs of the community is intimately associated with major route development, which development is going forward with or without the advice and judgment of transit values.

Route planning and development is but one phase of the entire scheme of community growth. Since traffic demand stems from land use and is greatly affected by the very pattern and growth of the community itself, it is equally well to follow closely the other phases of community plans and development in that area where a particular transit property is found.

On those routes which the different forms of street travel must use in common, it is axiomatic that no one part of the stream can move with greater safety or facility than other parts of the same stream. The improvement of street traffic operations must accommodate all elements in the traffic stream for the common good of all. The struggle for improved traffic operation requires the closest cooperation in and understanding of traffic values by the transit operator and the street and highway authorities.

It is increasingly becoming necessary for the transit operator to develop in his organization the tools and skills which are needed to measure and interpret traffic values. In the strong competition for opportunity to render service in the transportation market, that agency which most closely fits the needs of the consumer of transportation is the agency which will survive and prosper. In order to

do this, it is essential that keen analysis be made of traffic demand and the methods of meeting that demand. Freedom of choice on the part of the transportation customer in the market place of transportation makes it vitally important to understand and meet the consumers' choice.

Since freedom of choice is inherent in the American tradition, it follows that little progress will be made by any attempt aimed at frustrating that freedom. Persons who seek transportation cannot be forced into transit or any other type of vehicles through regulation or stifling of competitive forms. Rather, such persons may be attracted only by a full understanding of their needs and a desire to render a service which will meet the consumers' choice. In this regard, the maintenance of a healthy central business district is advantageous to transit operation. Well-founded measures designed to protect and keep attractive the central business districts of our cities can well merit the support of transit operators. Free-wheel vehicles on an intensely developed network of streets will gravitate to those areas which are most readily accessible if their operators can find the services and goods which they are seeking. The decentralization of our cities will probably make for more traffic mileage but in thinner streams of movement.

The Effect of Congested Traffic On Economic Development

T. LEDYARD BLAKEMAN

Mr. Blakeman is Chief of the Bureau of Planning in the New Jersey State Department of Economic Development at Trenton. He was landscape engineer at Billings, Montana, in 1936. In 1937, he became Planning Technician for the Department of Public Works of Virginia, doing street intersection design, subdivision approval and re-design, surveys of population, land use, and income and cost analysis. In 1941, he became General Assistant to the Executive Director of the Hampton Roads Regional Defense Council. In 1944, he became the Planning Engineer for the New Jersey State Planning Board, initiating and directing all staff operations and setting up procedures for and directing the inventory of all public works to be included in a Federal Public Works Reserve.

IT WOULD be nonsensical to assign all the economic ills of an era to traffic congestion. But with complete justification, we may say that congestion in our cities and on certain of our highways is not only an economic liability in itself, but also induces other trends that are costly to the citizens.

The land-use pattern of a state or region is to some extent accidental. To a much greater extent, however, it is the result of specific physical location factors. For instance, one eastern state owes its high economic standing almost entirely to the fact that it has shore frontage on two of the greatest deep water ports in the world.

The choicest natural industrial sites on these harbors, however, are being vacated because of land-crowding and an inefficient street layout. Industry is leaving these areas. The enormous value of these sites in wages and taxes is therefore being partly or completely lost to the state. When an industry is forced out of a deep-water site it may quite easily leave the state to find another such site.

The traffic congestion and other elements of blight that result

from no planning or bad planning are usually more acute in the older urban areas but they are by no means confined to those areas. A faulty state highway system can do untold damage not only to industry and business but also to residential development. A highway policy based on solving problems only after they become intolerable can not only do direct damage to existing development but can also reduce enormously the attractiveness of an area for new industry, business and homes.

Congestion Hurts More Than Abutting Properties

A traffic facility is a service like a sewer or a water main. But because it is on the surface and because it carries people and because it is noisy, the importance of its service function is equaled or perhaps even surpassed by its effect on development. This effect is not confined to abutting properties. Traffic of all kinds, but particularly automotive traffic, is today the life blood of any area—state, a region or a town.

A traffic bottleneck is like a clot in the bloodstream. It reduces or stops the traffic supply to a town or an area and results in partial or complete loss of economic life. A highly desirable industry moved from the center of a large eastern city to a point fifty miles out in the country. Now it gets shipments from points in the city more quickly than it did when it was practically next door to the shipper. They find it easier to do business even with concerns in the city, now that they don't have to cross city traffic to do it.

Traffic conditions are so important to industry that the president of one of the largest companies in the country hired a traffic engineer to pick the site for one of their new factories. It was not put in the center of the labor pool, nor close to a source of water. It was located at the edge of town, near a traffic circle and between the highway and a railroad. These are two examples of a nationwide trend toward decentralization of industry. Every old city is losing industry to the peripheral areas. As materials become more available and the high cost of construction becomes accepted as normal this trend will increase.

Congestion Stimulates Decentralization

Factors other than traffic congestion are, of course, in some degree responsible for the flight of industry from our cities. Taxes in a few cases justify the move, and often the economics of a one-story operation are cited as a reason for moving out. In every instance, however, the difficulty of trucking and lack of parking facilities for the employees is given as a primary reason for leaving.

Traffic congestion has also driven out many home seekers. In their wake has gone much of the retail business that used to support the central city. The irony of this situation is that in many cases lack of planning has resulted in a duplication at the periphery of the very conditions which forced industry and homeseekers out of the central areas.

Quite logically, one might ask why a state or regional planning agency should be concerned with the movement of industry, people and business from the center to the periphery of an urban area. So long as they don't leave the area altogether they still pay taxes and they still supply employment. There are several reasons why excessive decentralization hurts the economy of an area.

First, cities rise at certain points for specific reasons. They don't just happen. The site had certain location advantages which in many cases are still there. In this highly competitive age the state or region that cannot take maximum advantage of such location advantages may lose industry to another state. A recent survey showed that of a hundred large plants on deep-water sites, ninety-six planned to move out. Once an industry decides to move, there is no telling where it will land. It might find better conditions in a different state. Even if it stays in the same state but moves inland, it may lose business. The competitive advantage it might have enjoyed from a properly developed deep-water location would have brought more money to it and consequently to the people of the state and region.

Another economic factor that demands better traffic conditions in our central cities is the cost of duplicating at the periphery the tremendous investment for sewers, water mains, schools, streets, etc., that are already installed in the central areas. Many of these facilities have been enlarged and adapted in some degree to the

peculiar demands of industry. Water-using industries and chemical plants need more water and larger sewers than are normally provided in residential or commercial areas. Industrial trucking demands heavy duty street paving. Decentralization of homes leave in the central city excess capacity not only in water, sewerage, gas and electricity, but in schools, fire houses, police stations and parks. All of these facilities must be duplicated at the periphery.

Effect of Decentralization on Traffic

There is another costly result of this decentralization which is of utmost importance to traffic engineers and planners. The further people live from their place of employment the more they add to the traffic problem. Ideally everyone should be able to live where they could walk to work. This, of course, would make for a more pleasant life and more community spirit. In addition, however, it would mean that our highways and streets would be relieved of the morning and night commuting traffic. They would be left free for trucks, pleasure cars and shoppers. Obviously, this is a Utopian idea which may never be fully realized, and certainly not in our lifetime.

It will occur to many people that the decentralization of industry and homes with the evils previously outlined has in it also the seeds of a development where people could live close to their places of work. This is perfectly true, but for the trend to result in communities so designed that places of work and homes are properly related to each other demands a conscious and concentrated effort on the part of the peripheral communities into which the people and industries are moving.

To date, no such conscious attempt has been made in this country. Industry often locates without any particular regard to the availability of concomitant sites for good residential development. Conversely, people in seeking new home sites do not often seek them with an eye to new employment in the immediate vicinity. Instead, they think in terms of a good location for commuting to the site of their present job. To solve this problem properly it would be necessary that a regional agency of some sort analyze the potentialities of the various sections of a metropolitan region for industrial and

residential development; select certain areas and prevail upon industries of the proper type to move to these locations and either finance themselves or set up a limited dividend corporation to provide homes for their employees.

The only examples of such an operation with which the writer is familiar are the garden cities of Letchworth and Welwyn in England, planned years ago by Sir Raymond Unwin and F. J. Osborne. These communities are consciously developed for a population limited to approximately sixty thousand people and with industry so located that it is accessible to residential areas but not injurious to them. We have, of course, in this country a few war-born communities but in many cases the people in these communities were dependent entirely on a single industry and this industry was often specifically designed to meet the production needs of a war economy and not considered as a continuous source of employment.

Planning agencies, and particularly those that serve not only central cities but the other component parts of a metropolitan area, are beginning to realize the necessity for working with the communities to develop a logical land use pattern. Only in this way can the enormous volume of commuting traffic that is choking our streets and highways and resulting in further devaluation of central business and residential properties be reduced. This solution, however, will take time. Another method is the redevelopment of our downtown areas so that the conditions which are forcing people to move out may be partially eliminated. In this way the smaller families and the older and younger families can be housed under decent conditions in the central areas and consequently closer to their places of work.

Immediate Solution in Good Traffic Engineering

More immediate relief for the intolerable traffic conditions is the excellent work that traffic engineers are performing day in and day out for our cities. Such things as provision of more off-street parking space; the use of one-way street systems; intersections designed to keep automobile and pedestrian traffic moving safely; limited access streets and highways; all these traffic engineering devices are being

put into practice by forward looking states and cities. As a result, the trend toward decentralization and the consequent decay of our downtown areas is being considerably reduced.

There is still much to be done, particularly in the development of regional planning that can consider the peripheral and central problems jointly as they affect each other. In the meantime, however, the only hope for a balancing of the economic budget in our urban areas is an intelligent use of existing streets and highways. This can be accomplished by competent over all planning and adequately staffed and supported traffic engineering.

Analyzing a Complicated Interchange

CHARLES L. AUSTIN AND HENRY FAGIN

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TONNELE CIRCLE, a highway interchange in Jersey City where many motorists have spent many hours, is the front gate to New York City. The circle sits at the southern extremity of the rocky Palisades. Elsewhere, these bunker-like Palisades block access to Manhattan from the flatlands to the southwest.

Although new highways, bridges and tunnels slowly are changing the old pattern, the main lanes of traffic flowing between the continent and its major seaport now meet at Tonnele Circle before spreading out again to the several tunnels and bridges that cross the Hudson River.[1]

[1] Figure 1.

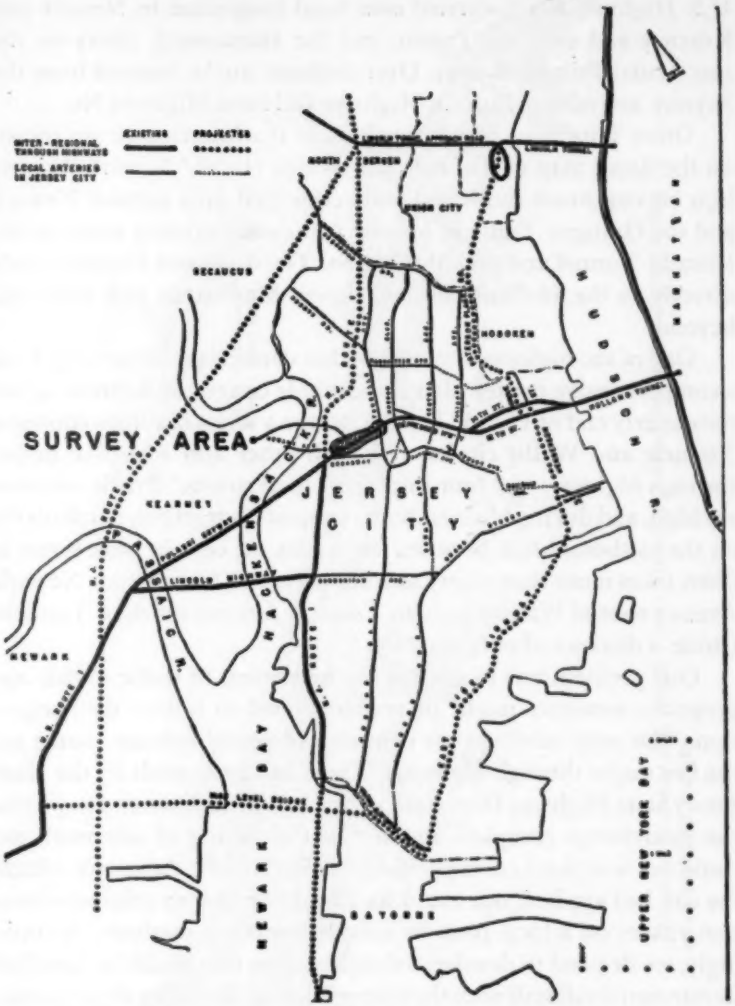

FIGURE 1. Through Highways in the Jersey City Area.

Coming up from Philadelphia, Trenton, and New Brunswick is U.S. Highway No. 1, carried over local congestion in Newark and Kearney and over the Passaic and the Hackensack rivers on the spectacular Pulaski Skyway. Over-the-road trucks, banned from the Skyway, arrive over Lincoln Highway and State Highway No. 1.

Other important routes involved in the interchange are shown on the detail map of Tonnele and Wallis circles.[2] Newark Avenue taps an important industrial and residential area around Newark and the Oranges. Tonnele Avenue is the only existing route to the Lincoln Tunnel and mid-Manhattan. The depressed highway leads directly to the Holland Tunnel, lower Manhattan and Brooklyn beyond.

One of the highway weaknesses that demands solution as part of a comprehensive master plan is the whole congested interchange at the easterly end of Pulaski Skyway, where a series of ramps connects Tonnele and Wallis circles with each other and with five major through-highways and four important local streets.[2] Traffic volumes are high, and during business hours congestion is severe, particularly on the eastbound link between the circles. At certain peak hours it often takes more than thirty minutes to travel by car from Newark Avenue west of Wallis Circle to Tonnele Avenue north of Tonnele Circle, a distance of only 0.7 miles.[2]

Our problem was to analyze the movement of traffic so that appropriate measures might be recommended to relieve the congestion. The only existing data consisted of yearly volume counts on the five major through-highways. These had been made by the New Jersey State Highway Department at points some distance away from the interchange complex. Because of the timing of our work we could not wait for a county-wide PRA-State traffic survey for which the city had applied, nor could we afford to make an origin-destination survey on a local basis by sample interview methods. Accordingly, we decided to develop a simple system that could be handled by our own small staff with the cooperation of the police department, and by which we could learn the relative volumes using various routes through the interchange complex.

[2] Figure 2.

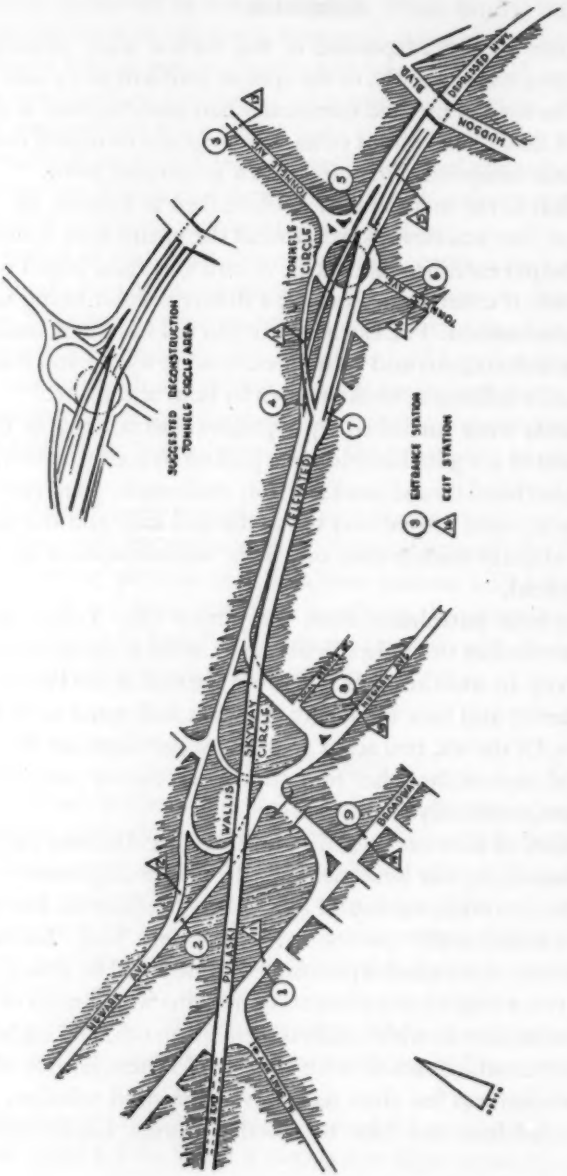

FIGURE 2. Tonnele and Wallis Circles. Drawing of Road Network showing Cordon Entrance and Exit Stations.

A Solution

Our solution was an adaptation of the cordon idea, already well known among traffic people, to the special problem of a traffic interchange. The cordon method commonly had been applied to obtain a picture of flow in and out of cities; we proposed to regard the complex of roads comprising the circles as a miniature town.

Essentials of the method may be described as follows: an imaginary cordon line was established around the entire area, cutting all of the principal entrances and exits. A card was then issued to each vehicle where it entered the cordon, a different color being used at each entrance station. The cards were collected in hourly batches at the various exit stations and subsequently were sorted and counted. This yielded a full count, broken down by hour and route.

The cards were furnished by a printer specializing in tickets. They measured 2 x 3 inches and were packed in consecutively numbered, rubberband-bound stacks of 100 cards each, 5000 cards in a box. The 2 x 3 card proved easy to handle and sort; and the stack of 100 cards, slightly thicker than one inch, was convenient for handling in the field.

Twenty-four patrolmen from the Jersey City Police Department, supervised by two police lieutenants, acted as the field workers for the survey. In addition, two men from the staff of the Port of New York Authority and four men from our own staff acted as technical supervisors. Of the six, two acted as roving supervisors for the entire project, and each of the other four supervised two or more stations grouped geographically.

The relief of men on duty distributing or collecting cards was handled entirely by the lieutenants of the police department. This phase of the operation was found to be highly important, since men on duty at heavy traffic points were extremely busy. Indeed, in further surveys, more careful planning of reliefs will be arranged.

There was a total of seventeen stations: nine were points of entry into the cordon area at which tickets were given out, and eight were points of exit at which tickets were collected.[2] Where hourly volume in one direction was less than six-to-seven hundred vehicles, traffic was channeled into one lane by wooden horses. Cards were dis-

[2] Figure 2.

tributed or collected by one patrolman. When hourly volumes exceeded this figure, it was found necessary to use two men. Warning signs made by the police department were mounted on roadside poles a few hundred feet before each station. However, these signs proved unnecessary since under light traffic conditions the patrolmen could stop each vehicle as it approached, and under heavy traffic conditions the backlog of cars proceeding slowly through the distribution or collection point served as a warning.

At points of entry into the cordon area, cards were handed out continuously for the entire duration of the count. At the points of exit the cards were collected continuously, but placed in large envelopes in hourly batches. The envelopes had been prepared in advance, marked with the station and the hour; and when the cards collected in a given hour had been deposited in the correct envelope, the next envelope was substituted at the beginning of the ensuing hour.

In this way hourly breakdowns were obtained with no danger of mixing the cards by mis-handling after collections. In the subsequent counting process, the tabulator opened and counted one envelope only at a time, noted the results on the envelope, replaced the cards bound in bundles by color as sorted, and closed the envelope before proceeding to the next one.

The Technique

All preliminary preparations were made well in advance of the day of the count, since the exact date on which it could be made was indeterminate, depending on the availability of surplus patrolmen. The survey was made on December 23, 1947. We had planned to count from 7 A.M. to 7 P.M. Since it was not possible for us to instruct the patrolmen in advance, instruction sheets were distributed and brief oral instructions were given at a central point on the site of the survey just before the starting time. Ticket distribution was begun at about 6:55 in order to assure a full hour of count in the first hour.

It was raining lightly at this time, and the rain continued intermittently until 2 P.M. when it changed to light snow. By 4 P.M. it

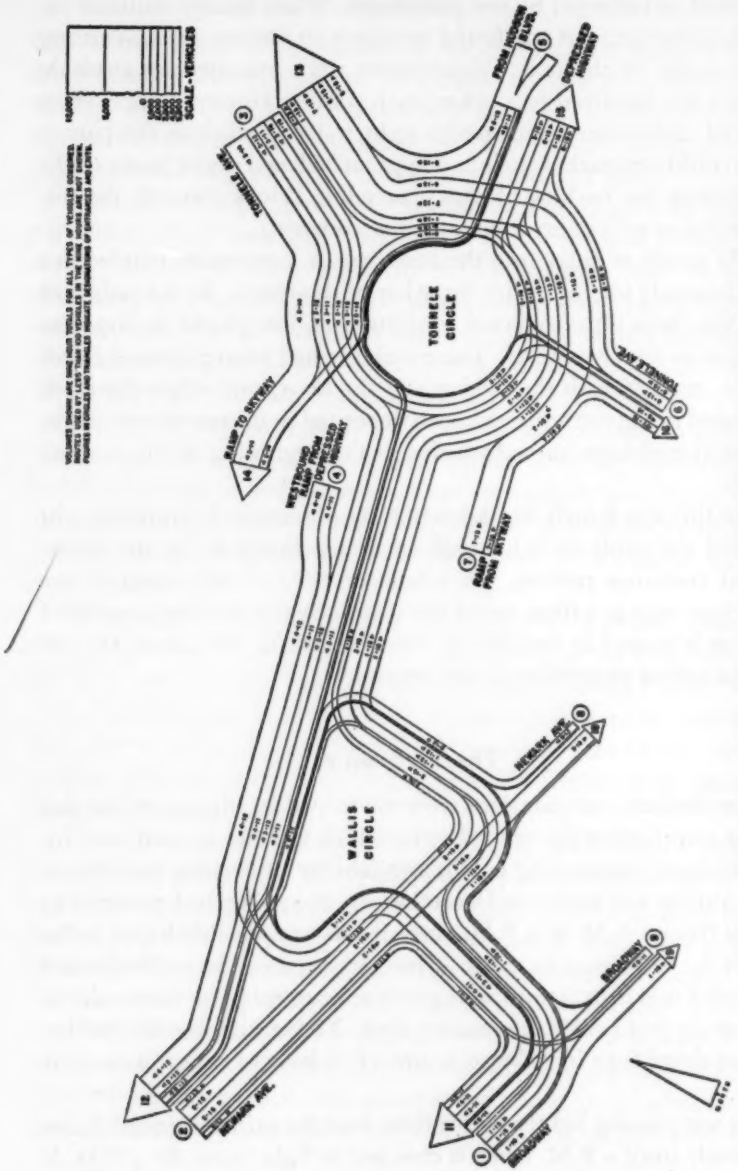

FIGURE 3. Traffic Flow Diagram Tonnele and Wallis Circles Showing Relative Volumes Using Various Routes—7 A.M. to 4 P.M.—December 23, 1947

was snowing heavily, the roadways were becoming slippery and visibility was poor. Since it was apparent that before long it would be dark and hazardous for survey personnel, and that driving conditions were so adverse as to affect traffic volumes, the count was ended at 4 P.M. A summer count from 7 A.M. to 7 P.M. could have been made without fear of darkness and with less likelihood of abnormal conditions resulting from bad weather. The resulting figures would have been somewhat more representative of the condition of maximum volume.

Considerable difficulty was experienced during the day from the effect of the wet weather on the envelopes used for collection and even on the tickets themselves. Some type of waterproof container that could have been emptied readily into the proper paper envelope every hour would have been more satisfactory for use at the collecting stations.

Both in order to gain some idea of seasonal variations at the Tonnele-Wallis circles complex and to tie our results in with their regular volume counts, the New Jersey State Highway Department took special volume counts during the week of our survey. These counts were made by automatic machines on Tonnele Avenue State Highway No. 1 just north of Tonnele Circle from 3 P.M. December 18 to 9 A.M. December 26, and were broken down by hour and direction. The Port of New York Authority took other machine counts of volumes for the 24-hour period ending 4 P.M. December 23 on the ramp from Hudson Boulevard to Tonnele Circle. This enabled us to determine the relative volumes of traffic entering station 5 from Hudson Boulevard and from the Depressed Highway.[3]

Figure 3 is a traffic flow diagram which expresses our analysis of the count. The principal routes contributing to the congestion at any point on the complex can be ascertained readily by inspection of this diagram. Similarly, the effect on the points of congestion of any projected by-passes or other diversion of traffic easily can be determined. Detailed tabulations have been omitted from this paper since it was not felt that they would be of general interest.[4]

[3] Figures 1 and 3.

[4] Complete tabulations may be obtained by writing Churchill-Fulmer Associates, Room 1018, 15 Exchange Place, Jersey City 2, New Jersey.

Two corners of the card used in the survey were perforated to distinguish between large and small vehicles by having the issuing officer detach a corner when giving the card to the driver of a truck or bus. One particular corner was designated for removal so that the cards might be reused in another survey and the other corner used at this time. This method of separating types of vehicles was not successful. The perforations weakened the corners of the cards to such an extent that many fell off in handling. Furthermore, in the press of passing out the cards under heavy traffic conditions, the wrong corner frequently was removed. While the latter error was not serious, the former one was. An attempt was made to correct mathematically for the loss of corners, but we were unable to set up a valid set of assumptions concerning the rate of accidental loss and consequently had to abandon the attempt.

A count of undistributed tickets at the end of the survey indicated that slightly over 95 per cent of the total number of tickets distributed had been collected. An approximately equal proportion of vehicles probably entered the cordon without receiving tickets. On this basis it is estimated that the tabulated figures represent about 90 per cent of the actual volumes on the day of the survey.

Resulting Conclusions

Three major highways are now under consideration. These, if constructed, will have a marked effect on the pattern of traffic using the network of Tonnele and Wallis circles. Even though a thoroughly accurate determination of the effect of these new facilities must await the results of a complete origin-and-destination survey of Hudson County (already requested), common sense estimates of the ratios of local and through traffic are sufficient to approximate the effect of the proposed highways on the volumes of traffic using the various routes through the interchange. It should be noted that the effect of the several proposed new highways is not necessarily cumulative along all of the existing routes because the first highway built may divert traffic which the second would otherwise affect.

Trans-Meadow Highway. The State of New Jersey is definitely

committed to construction in the near future of a freeway across the meadows and connecting State Highway No. 25 in Newark with State Highway No. 3 in North Bergen. This highway (State Route No. 100 on the Plan) will form a by-pass that will carry a considerable amount of the traffic which now uses the Tonnele-Wallis circles in-

Table I

PRINCIPAL ESTIMATED EFFECTS OF TRANS-MEADOW HIGHWAY ON TRAFFIC NOW USING THE TONNELE-WALLIS CIRCLE INTERCHANGE**

*Route Through Complex**		*Estimated Traffic Diverted*	
In	*Out*	*Description*	*Percent*
1	13	All through traffic from southwest	50
2	13	All through traffic	90
3	11	All through traffic to southwest	50
3	12	All through traffic	90
3	14	All through traffic	90
7	13	All through traffic	90

terchange. Table I shows our estimate of the major traffic volume reduction in the complex which may be anticipated when the trans-Meadow Highway is completed.

Northern Extension of State Highway No. 1. It is proposed by the State to reconstruct State Highway No. 1 between Broadway in Jersey City and the trans-Meadow Highway in North Bergen in a new location west of Tonnele Avenue. (See map.) This route should be built as a freeway, with complete grade separation interchanges at Broadway, Newark Avenue, New County Road, Secaucus Road and the junction with the trans-Meadow Highway (State Route No. 100.) We estimate that this facility so constructed would result in the traffic volume reductions shown in Table II.

County Circumferential Highway. The county engineers have proposed a highway loop around all of Hudson County. A portion of this loop would connect the Essex County major highways in the vicinity of Newark Airport with the Holland and Lincoln Tunnels

* See flow diagram for explanation of route number designations.

** Percentages indicate isolated effect of each facility and cannot be applied cumulatively.

Table II

PRINCIPAL ESTIMATED EFFECTS OF PROPOSED NORTHERN EXTENSION OF STATE HIGHWAY NO. 1 ON TRAFFIC NOW USING THE TONNELE-WALLIS CIRCLE INTERCHANGE**

*Route Through Complex**		*Estimated Traffic Diverted*	
In	*Out*	*Description*	*Percent*
1	12	All traffic	100
1	13	All through traffic	90
2	11	All traffic	100
2	13	All through traffic	90
3	11	All through traffic	90
3	12	All through traffic	90
3	14	All through traffic	90
7	13	All through traffic	90

via a high level bridge over Newark Bay, a connecting freeway along the Bayonne-Jersey City boundary to New York Bay and thence north to the tunnels on a projected freeway through the east side of Jersey City and the west side of Hoboken. (See map.) It is expected that the new route, which avoids the delays attendant on the present low level river crossing at Communipaw Avenue, will be used by a major portion of through vehicles, particularly trucks, headed to and from the Holland Tunnel and Hoboken. Furthermore, a portion of Hudson County north-south traffic now using the west side will be attracted to the projected east side highway. As a result of this diversion the principal routes through the Tonnele-Wallis complex will probably lose traffic as estimated in Table III.

At five principal points present congestion is directly caused by a volume of traffic in excess of roadway capacity:

1. Tonnele Circle just south of the ramp leading to the depressed highway;
2. Tonnele Circle between the entrance of the eastbound ramp from Pulaski Skyway and the southerly leg of Tonnele Avenue;

* See flow diagram for explanation of route number designations.

** Percentages indicate isolated effect of each facility and cannot be applied cumulatively.

3. Newark Avenue between Wallis and James Avenues;
4. Newark Avenue just west of Wallis Avenue;
5. James Avenue north of Newark Avenue and south of State Highway No. 1.

Each of the enumerated stretches is a place where traffic weaves. Congestion at the last three points listed is merely the result, however, of congestion at the first two: eastbound and northbound traffic moves so slowly through Tonnele Circle at peak hours that it backs up into James and Newark Avenue on Wallis Circle and thus inhibits the fluid weaving motion which could take place with free-moving vehicles. When congestion at Tonnele Circle is eliminated, the problems at Wallis Circle will be solved automatically. Furthermore, the projected new traffic routes described in the foregoing text will tend to reduce the sheer volume of traffic at all points in the complex.

Table III

PRINCIPAL ESTIMATED EFFECTS OF PROPOSED SOUTHERN AND EASTERN PORTIONS OF COUNTY CIRCUMFERENTIAL HIGHWAY AND HIGH LEVEL BRIDGE OVER NEWARK BAY ON TRAFFIC NOW USING THE TONNELE-WALLIS CIRCLE INTERCHANGE*

*Route Through Complex**		*Estimated Traffic Diverted*	
In	*Out*	*Description*	*Percent*
1	13	One-third of through traffic	30
1	15	Two-thirds of through traffic	60
3	11	One-third of through traffic	30
3	15	Half of all traffic	50
4	11	Two-thirds of through traffic	60
5	11	Half of all traffic	50
5	13	Half of all traffic	50

Since the two congestion points at Tonnele Circle are the key to the congestion at all five points, we shall now analyze points 1 and 2 in detail. Table IV shows our estimate of the volumes which would have resulted at these points during the peak hours on the day of the

* See flow diagram for explanation of route number designations.

count if the proposed alternative traffic routes described above had then been in operation; and it compares these estimated volumes with the actual maximum and minimum volumes observed on that day.

Table IV

ESTIMATED VOLUMES OF TRAFFIC AT TWO CRITICAL POINTS ON TONNELE CIRCLE WITH VARIOUS DIVERTING HIGHWAYS IN OPERATION, COMPARED WITH ACTUAL MAXIMUM AND MINIMUM VOLUMES

	Location	
	1	*2*
Present volume during peak hour observed (3–4 P.M.)	1610	1571
Estimated peak hour volumes with the following facilities in operation:		
A. Trans-Meadow Highway	933	894
B. State Highway No. 1 northern extension	855	816
C. East Side Highway and Newark Bay Bridge	1374	1338
A. and B.	843	804
A. and C.	722	686
A., B. and C.	699	663
Present volume during minimum hour observed (7–8 A.M.)	1192	1052

As the table demonstrates, any of the proposed facilities except C. alone would have cut the volume of traffic on Tonnele Circle at the peak hour to less than the actual traffic during the minimum hour observed; and at the minimum hour there was no congestion whatever in either circle. The solution to the problems of all five points, then, depends on the speediest possible construction of the three projected routes.

Since the trans-Meadow Highway is a legislated route intended to be under construction in the near future, and since by itself it will go a long way to relieve all five of the most congested points in the Tonnele-Wallis circles road network, its early completion will be of great advantage to Jersey City.

Upon completion of the trans-Meadow Highway, the facilities which would most relieve the remaining traffic burden on the Tonnele-Wallis circles complex are the proposed high-level bridge over

Newark Bay, the cross-country freeway, and the easterly portion of the Circumferential Highway from Point Breeze to the Lincoln Tunnel. As a by-product, the latter portion would also benefit Jersey City by improving access to the industrial sections along the Hudson River waterfront.

Further Considerations

Even at low volumes of traffic, congestion exists at certain locations in the Tonnele-Wallis Circle complex by reason of inadequacies in roadway design. All through eastbound traffic is required to swerve around Tonnele Circle, a condition which forces all vehicles to slow down considerably. Unfortunately there seems to be no way by which this condition can be avoided without altering some of the roadways in the area to an unreasonable degree.

Some of the inconveniences caused by the swerve, however, can be alleviated. The cramped radius of the right curb where eastbound traffic on State Highway No. 1 enters Tonnele Circle makes it necessary for large trucks and semi-trailers to swing wide into the left lane of the circle as they turn into it, thus cutting off traffic rounding the circle from the north. Relocation of the pier that supports Route 25 above and is immediately adjacent to the curb just described, would permit the radius of the turn to be greatly increased by cutting back the curb. This would enable trucks to stay properly on the outside lane when entering the circle so as not to clash with other traffic.

Weaving distances all around Tonnele Circle are inadequate both because of the circle's small circumference and because of the profusion of the radiating roads. However, the situation is particularly acute between the ramp from Hudson Boulevard and the northerly leg of Tonnele Avenue, where weaving space is almost non-existent.

Because the circle cannot permit a weaving function at this point, it has been necessary there to station a traffic officer who allows alternate streams of traffic to move. During the hours of heavy traffic, the necessary intermittent stopping of traffic at this point on the circle further adds to congestion elsewhere. While it is impractical

to increase the size of Tonnele Circle generally, it is feasible to extend the circle to the north so as to create weaving space in that section of the circle which most urgently needs it.

Inspection of the Traffic Flow Diagram shows that over half the traffic entering Tonnele Circle from the Boulevard ramp and crossing the stream of traffic on the circle is destined for Pulaski Skyway (State Route No. 25.) All of this traffic could be eliminated from the circle by the construction of a new ramp from Hudson Boulevard to Route No. 25 directly over the low-level ramp from the circle to the Depressed Highway. The new ramp would connect the Boulevard with the westbound lanes of Route No. 25 just above the west end of the opening over the ramp between the circle and the Depressed Highway.*

Congestion in the two circles will be fully relieved only upon completion of one or more of the regional routes contemplated for the vicinity. These routes in effect will cause much traffic to by-pass the Tonnele-Wallis circles complex. Immediate and long-range benefit would derive from the last three suggested measures—measures that propose relatively minor constructions at Tonnele Circle.

* See map.

Are Your Traffic Police Trained?

FRANKLIN M. KREML

Mr. Kreml is director of the Northwestern University Traffic Institute and of the Traffic Division of the International Association of Chiefs of Police. He served in all divisions of the Evanston, Illinois, Police Department, working his way through the ranks to lieutenant and director of the city's accident-prevention bureau. He organized this bureau, the first of its type in the country. The Traffic Institute has trained more than 1,600 police officers. The Traffic Division of the IACP has assisted in reorganizing traffic-accident prevention activities in city, county and state police departments. It is now doing similar work in Chicago.

AMERICA is a big country—a wealthy country. Nature endowed it with coal, ore and timber, gave it thousands of square miles of rolling, rich land upon which to grow enough food and livestock to feed ourselves and half the world.

But that is not all. Our people have had the vitality and imagination to build within this country one of the most dynamic systems of living ever found. The system may have its faults, but it is still the best system yet devised.

A large share of what we have accomplished was made possible by the transportation system that we built. In the beginning it was largely the steamboats and barges on our rivers and canals that led us to grow out of the home-workshop era. Boats and barges made their way into the Ohio country with manufactured goods from the east; and returned with agricultural products.

Later, railroads flung tracks across mountains and plains, making this country the largest free-market region in the world. And finally, the motor vehicle and good highways came to complete the transportation chain, linking every city and every squatting huddle of cross-roads buildings in America.

A packet of needles manufactured in New Jersey could be sold in Iowa within a few days—and at a profit. Our manufacturers found their market was the whole continent.

Today, more than ever before, we depend upon our highways for

the transportation of persons and goods. Actually, the role of transportation in the creation of our wealth is so taken for granted that people sometimes fail to grasp its full import. We seldom stop to think that full use of our land resources was possible only after the advent of the motor vehicle and highway era.

As time is measured in the history of our country, the other changes wrought by the motor vehicle have been meteoric. The advent of better and quicker transportation, both public and private, caused a mass decentralization of homes, schools, of stores, and recreation centers. It brought about the rapid growth of suburbs, and linked them so solidly that often only a couple of house numbers separates one town from the other. In the ten years from 1930 to 1940, the suburbs of 140 principal cities gained three million population while the cities themselves gained only 2,500,000. Some of our older cities actually lost population while their outlying areas mushroomed into thriving communities with attractive shopping sections.

During the war, the part played by motor vehicle transport in keeping factories humming, in supplying troops at home and abroad was tremendous. Much of our success in acting as arsenal for the world is due to the facility of movement our highways provided.

Today we are facing problems generated by the explosive growth of our highway transportation system. Many of our people have stepped from the old buggy, for which many of our city streets were built, to the Model T, and on to our present chrome-covered 80-horse-powered vehicle. The old dray that once hauled goods from the freight depot is now a 16-wheeled super-van capable of hauling off the entire stock of what was once our general store.

Loss in Lives, 32,000; In Money, $2,200,000,000

But the people who drive these cars, many of them, have not advanced in their knowledge of driving or of safety. They have failed to keep up with the progress set by manufacturers. And in many areas of policing we are operating with the same techniques used in the days of gas light and horse-drawn street cars.

There is ample evidence that Americans have not developed

as fast as the vehicles they use. During 1947 the traffic toll was 32,000 deaths and approximately 1,100,000 non-fatal injuries. Economic losses resulting from traffic accidents were estimated at $2,200,000,000.

The traffic problem is snowballing. Before the war there were about 34 million registered motor vehicles in the United States, and the number today has increased to more than 37 million. We can expect this figure to jump to 45 million by 1960. So if you are a public official, you are in the traffic business—completely.

We have a few among us who say that in view of the tremendous number of miles our vehicles travel each year our loss in lives and property is not an exhorbitant price to pay as the most highly mechanized nation on earth. That is not true. We kill and maim too many with our vehicles. This plague is not like cancer that cannot yet be controlled because the causes are not known to medical science. Traffic authorities know the causes of traffic accidents and much of our congestion, and they also know that a large share of each can be prevented. If you want proof, look to the cities that have won the National Traffic Safety Contest. Look to any city with a sound program of traffic law enforcement, engineering, and education. They are reducing their accident toll. They are helping business and industry in their communities. They are helping the laboring class, and thus their entire community, by making their cities safer places in which to live and work.

Many of us who work with the traffic control problem from day to day grow accustomed to the continuing reports of stupidity and carelessness that result in accidents and deaths. It is inevitable. But that does not excuse us from providing the best possible control and education program that our energies and abilities can afford.

The Two Most Important Problems

The pattern of a workable program, applicable to all cities and states, is set forth in the President's Highway Safety Conference. Know these recommendations. Put them to work.

It seems to me that traffic control and traffic accident prevention —two problems virtually identical—constitute the most important

task confronting every police department and municipal court. It will be overshadowed from time to time by a serious labor disturbance, or an outbreak of violent crime. But labor disturbance and crime waves are usually of short duration, whereas traffic, like old man river, rolls on forever.

Moreover, the handling of traffic is a pretty sure test of democracy because it is something our citizens can see in front of their eyes. As a police official, you may quietly cure an aggravated racial situation; you may wipe out a gang of racketeers; you may solve a tough homicide case, or you may clean up a vice situation. But those problems are removed from the average citizen: they are remote police problems in which he has no more than casual interest.

But your citizen can see traffic accidents happening and also he can watch you enforce traffic laws to prevent these accidents. He is eager to tell you about traffic-law violators who were not arrested. He might not see a murder committed, or an assault, but he does see speeders and reckless drivers, and he wants to know what you as a police administrator or official are doing about them.

And by the same token, if he sees the police on the job, if he keeps reading in his newspapers about drunken drivers going to jail and speeders paying fines, if he observes that traffic in his town is being moved expeditiously and safely—why, he'll begin to understand that his local government really is functioning, even though he complains when he gets a traffic ticket himself. And he'll be a believer when his police department tells him that they are in the business of protecting life and property.

Many police departments have failed to provide adequate training. It may be because of lack of money, time or initiative. Whatever the cause may be, it will no longer justify running your police department without an intelligent personnel training schedule.

Why Police Training Is Necessary

The money can be raised, instructors can be obtained and time can be taken from other duties to allow your men to learn how to conduct themselves while controlling traffic and investigating accidents.

Every city claims that its traffic problem is peculiarly aggravated by a special set of circumstances over which it has no control. It may be the nature of the citizens, the antiquity of the streets or the unfortunate location of industrial establishments. No doubt these may be complicating factors. But it is equally true that they can be circumvented by intelligent direction and hard work. Part of the hard work is the training of competent traffic law enforcement personnel, and the inauguration of an intelligent program of control.

Why is police training necessary? Because police *work* is *complex*.

In the old days (and unfortunately in some places today) new officers were handed a night-stick and sent into the streets with the admonition to "enforce the law and don't get into any trouble." Maybe they were assigned to work with a veteran officer who started his traffic work when the city had four automobiles and who from bitter experience felt that the best type of traffic control was a passive view of the streaming vehicles from a doorway.

"Don't ask for trouble," he told his charge, "keep away from motorists and pedestrians unless there is an accident. Then pick up the injured, clear the streets, and let the lawyers do the rest."

That is an attitude we must combat. Fortunately, it is passing, along with the rubber truncheon and the concept that a good officer was only as good as he was hard-boiled.

In the early days, our police could afford to be tough. They dealt largely with criminal elements. The mass of citizenry had little contact with them. If police were hard, they had to be that way to do their jobs. But with the advent of mass production techniques and the car-in-every-garage era, the police were forced to handle the movement of vehicles. People started getting killed. Laws were passed, and police had to enforce them.

The police started using the same approach with the wife of an alderman caught running a red traffic light as they did in putting the arm on a drunken brawler creating a disturbance in the red-light district. Resentful explosions that followed were natural. The panacea for the situation, not yet applied nationally, was careful selection and training for traffic personnel whose duties brought them into continuous contact with all strata of society. Officers must

have a knowledge of human relations to deal effectively with all types of individuals and to enforce the traffic laws fairly but firmly without needlessly antagonizing people.

Specialized Traffic Training

They must do an educational job as well as a disciplinary one. Moreover, the traffic officer must understand certain engineering fundamentals with regard to the control of moving vehicles and the investigation of accidents. He must know the traffic laws and the legal procedures involved in the enforcement of those laws.

Because of the complexity of traffic control work, some of the training is specialized. It must be so because the work in which the men will be engaged is specialized.

In many departments accident investigation squads investigate all traffic accidents. They are needed because intelligent accident investigation requires a high degree of specialized training. Members of these squads are experts in first aid. They can take pictures of the accident for court use; they can compute speed from skidmarks; they are expert in questioning witnesses. They have tremendous knowledge of physical evidence, developed to a point in some instances where their record of hit-and-run-driver arrests and convictions is impressive enough to act as a deterrent to others who might gamble on getting away. Specialists in maintaining accident records, in analyzing records and in applying the principle of selective enforcement are also part of today's efficient department.

Your city needs such a corps of experts to help in the control of traffic. This is an age of specialization. We cannot expect or train our entire police force to become experts in all phases of police work. We must select those best suited to this work and train them to do it with speed and efficiency.

This does not mean that they shall be directed or allowed to handle only the traffic control phases of police work. Many critics of specialization have the mistaken idea that traffic men become an elite part of the police department who refuse to pay proper attention to other aspects of police work; and conversely, that other men on the department, because a traffic division is in existence, ignore

traffic law violations, because "that work is the responsibility of traffic men."

Chicago's New Traffic Program

Wherever this condition exists, it is the fault of the police administrator. It should not be allowed to continue and can be prevented by proper administrative orders and disciplining control.

Chicago is a good example of what can be done. The city is establishing a new traffic control program with the assistance of the Traffic Division of the International Association of Chiefs of Police. The division includes carefully trained accident investigation units, enforcement teams, intersection and parking control men mounted on three-wheeled motorcycles. All have been carefully selected and trained.

But at no time during their training have they been allowed to believe that traffic control or accident investigation is the only responsibility they have. At no time have other members of the department been led to believe that now the city has an expanded traffic division, they can forget about vehicles and concentrate on door-testing and the continual hunt for criminals.

The Chicago department's general traffic administration Order No. 166, issued March 31, 1948, stated in part:

> "An expanded and reorganized traffic program is in process of establishment within this department. Certain elements are now being placed in operation, the program becoming operative on or about July 1, 1948.
>
> The establishment of an augmented Traffic Bureau, it is emphasized, is not to be construed as relieving the District commanders or their personnel from traffic responsibilities in their districts. (See Sect. II Par. G & Sect. III.) Conversely, officers assigned to traffic duty retain full responsibility of police officers for the public security and in all matters of law enforcement and will be employed in general police duty in accordance with Sect. II Par. G and Sect. III of this order.

I said in the beginning that intelligent traffic control is a complex business. It is. It requires unusual abilities and special training.

What Training Programs Should Include

The type of training your department should have will be determined by the type of control job that is necessary. The traffic training and traffic program for a department in Lincoln, Nebraska, will be different from that needed in a similar-sized town adjacent to New York City that must control the tremendous volumes of traffic making its way to and from that metropolis. But there are basic things that officers in each locality must know.

The program for both cities must include training of (a) administrators, the commanding officers who will direct the city's control program; (b) specialists, men who handle accident records and do analysis work; (c) new recruits, men starting service with the department; and (d) in-service training for veteran officers.

Let's take the training of the administrator first. There is no level of activity, no kind of police work, from the recruit to the chief's position, that could not be substantially improved by training. The training and experience that make an officer a good patrolman or sergeant will not meet fully the needs of his work as a captain. Men who are in command positions need special training, training they cannot always obtain from their department.

Specialists, men handling accident records and analysis, need additional training also. If facilities are available, recruit and in-service training can be carried on within the department.

The Northwestern University Traffic Institute offers a comprehensive four-and-a-half-month course in traffic police administration twice each year. In addition, the Traffic Institute offers three-week training courses at Evanston semi-annually, and the Traffic Division of the International Association of Chiefs of Police offer regional two-week courses in cooperation with universities throughout the United States. The IACP also offers aid with in-service and recruit training schools that offer practical assistance to the chief striving to obtain assistance with this work.

In addition, there are several pre-school training programs in

operation that offer four-year courses in police science and administration. Among these are the San Jose State College, San Jose, California; The State College of Washington, Pullman, Washington; and the Michigan State College of Agriculture and Applied Science, East Lansing, Michigan.

Other phases of police administration are taught at Indiana University, Bloomington, Indiana; the University of California, at Berkeley; and the University of North Carolina, Chapel Hill, North Carolina; and at other universities and colleges throughout the country. Police departments should investigate the training opportunities offered by universities and colleges in their states and make the best possible use of them.

Essentials of Police Department's Own Program

Wherever possible, the police department should develop and maintain its own training program. Although not all the administrative and specialized training can be obtained in this manner, the techniques employed in traffic law enforcement can be passed on to new men.

There are certain essential requirements for such a program:

1. Active support of officials must be obtained. It is necessary that the chief of police and governing officials of the city or state be so well informed of the need for sound traffic training, and the essentials of such a program, that they will endorse and support it fully.

2. Allotment of adequate time for training. One-fourth of the working time of an officer during his first year of employment, and at least five per cent of his time during each year thereafter should be devoted to training. This, of course, does not mean classroom work only.

3. Adequate funds must be provided to finance the training program, including salary of the training director and instructors. Expenditure of such funds is justified in the resulting improved efficiency of the personnel and department.

4. A general job analysis of the training needs of the rank and file officers and special job analyses of the training needs of commanding officers and specialists is necessary. The chief and all com-

manding officers should assist the director of training in making such analyses—at least to the extent of outlining the duties and responsibilities of each position.

5. The selection of a qualified director of training for the department.

All of these are important. The selection of a director of training is especially important. The man selected for this job must be interested in training and highly qualified as an instructor. It is his responsibility to make job analyses, plan the courses and prepare training schedules. He must select instructors, check the quality of their work. He is responsible for examining students to determine progress, must maintain discipline and often serve as an instructor.

As director of training he should have extensive policing experience and, if possible, some teaching experience.

Not all departments are able to establish such a program. Many are solving it by collaboration with other smaller departments, or with a larger department in neighboring cities.

A Suggested Curriculum

Larger departments include special courses for traffic recruits. Following is a suggested curriculum for such a course. It is a guide, subject to variation depending upon time available and the scope of the recruit, in-service, and special training courses being conducted by the department.

Subject Name	*Suggested Hours*	
	Desirable	*Minimum*
Introduction to Traffic Control	7	4
Local Causes of Accidents and Congestion and Local Accident and Congestion Patterns	5	3
Accident Investigation—What it is; Purposes and Values	3	1
Accident Investigation Procedures	12	8
Physical Laws and Skidmarks	8	6
Traffic Law—Vehicle Code; Principal Violations Elements; Important Court Decisions	20	10
Enforcement—General	4	2
Enforcement Policies and Tolerances	10	6
Enforcement Tactics and Patrol Procedures	12	6

Public Relations	6	4
Safety Education	4	2
Police Aid to Traffic Engineering	2	1
Traffic Flow Regulation Including Point Control	12	8
Motor Vehicle Operation and Maintenance	12	8
Applied Psychology	15	10
Geography of Jurisdiction; local points of interest and other information inquirers usually seek	5	3
Motor Vehicle Inspection	4	2
Description of Driver License Control Work, Traffic Engineering Work, Safety Education Work, etc. that is being done in department's jurisdiction	6	3
Intoxication Cases Procedure	3	2
Reports (Those not discussed in other subjects, i.e., accident investigation procedures, etc.)	8	4
*Scientific Aids to Accident Investigation	4	2
*Photography—legal and mechanics of	7	5
*Interrogation of Suspects and Witnesses	8	5
*Case Preparation and Court Work	8	5
*Law of Evidence	10	7
*First Aid	30	20
*Law of Arrest, Search and Seizure	12	8
*Self Defense and Prisoner Transport and Control	20	10
*Disposition of property impounded or held for safe keeping	4	2
*Department Rules and Regulations	15	8
*Use of Equipment, Pistol, Radio, Handcuffs, Club, Lights, etc.	15	7
*Problem people and places in jurisdiction	4	2

State men need additional subjects to cover their "special" traffic work, such as:

Driver License Examining	12	6
Weight Control	4	2
Suspension and Revocation Pickups	3	2
Public Speaking	15	10
School Safety and School Patrol Organization	10	6

Space does not permit a listing of subjects that should be included in courses for command personnel, in-service training, or

* These subjects are presumed to have been presented in the general recruit training. They are not strictly traffic subjects but must be covered in a traffic curriculum if not presented in other training.

routine recruit-training. Such subjects will of course vary with the length of the training period and caliber of instructors.

Finding capable instructors is difficult. Some officers are fitted for this work by education and inclination; others, no matter how efficient in their jobs, fail as instructors.

Some department training instructors use judges, prosecutors and others from outside the police field. They should always be selected for their teaching ability as well as for the knowledge of the subjects they will teach.

One fault of much of the training is that it fails to include enough training of an administrative nature. Personnel are taught the techniques involved in their day to day work, but fail to get a sense of the department operating as a unit. If men are given but a small amount of administrative training they would be able to understand how their work is related to the functioning of the entire department. They would also learn the problems of command and thus be in greater sympathy with the objectives of superiors, having gained insight into the reasons behind the desirability of attaining these objectives.

And finally, make certain that training follows a practical path, that it is geared to the department and its policies of action and not to an instructor's theories that may be sound but which have not yet been adopted by the department. There is nothing more disheartening to the police trainee after an extensive training program than to enter active police service and be met with a stone wall of resistance, either active or passive. This resistance can stem solely from the fact that the administrative and executive officers are not in tune with the training program.

Interest in police training has increased tremendously since conclusion of the war. Much of the training was brought about by the necessity of returning depleted departments to normal personnel strength. But more significant is the fact that an equal amount of the gain stems from knowledge of government officials that the police departments need, and must obtain, skilled personnel with which to control the traffic problem in this post-war period.

We are making progress in controlling America's traffic. Much of the credit must be given to the training programs now in operation. I am certain that our progress will continue.

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